Vol. XXIV, No. 3
APRIL, 1957

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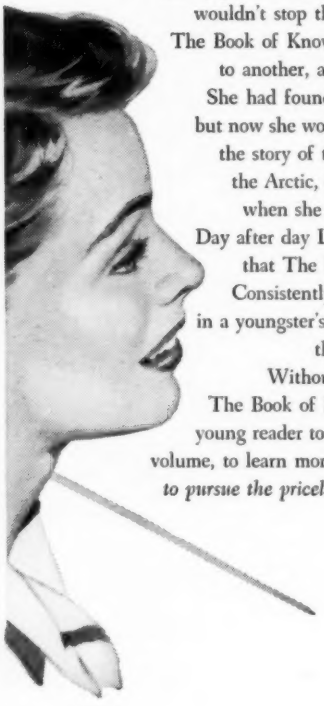
THE SCIENCE TEACHER

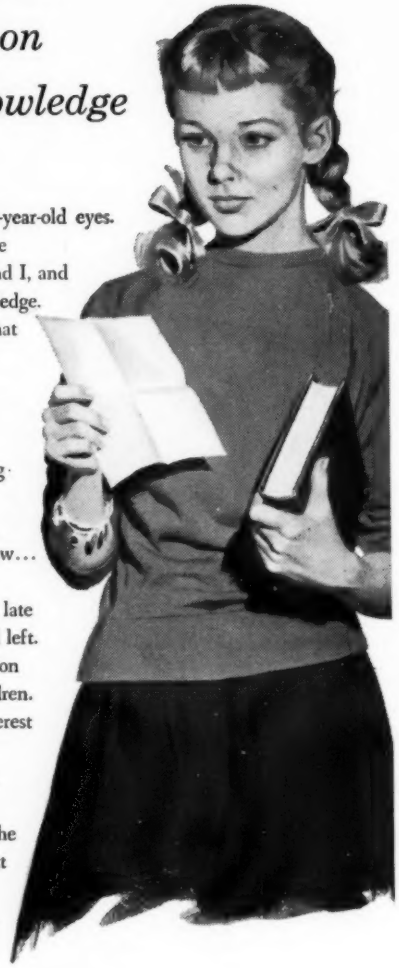
Explorers Roll
On The Target
Creative Manpower—Need and In
Ahead
STAR Awards
The Summer Co

JOURNAL OF THE NATIONAL SCIENCE TEACHERS ASSOCIATION

SHE WANTED A SIMPLE FACT

but she found herself embarked on a priceless treasure hunt for knowledge





She looked at me with her bright, curious, 12-year-old eyes. "Can you please tell me where to find out about the first explorers at the North Pole?" We went across the room, this eager youngster and I, and from the shelves I handed her the index volume of The Book of Knowledge.

Back at my desk, I watched her reading, and I smiled, knowing that I had started another child on a wonderful kind of treasure hunt.

In Volume 12 she found her answer, and I saw her stubby pencil making rapid notes. But I knew she wouldn't stop there, for—as always with The Book of Knowledge—one question was leading to another, and that one to the next.

She had found the who and written it down, but now she wondered about the why and the how... the story of the compass, the geography of the Arctic, the culture of the Eskimo. It was late when she finally put the volumes back and left.

Day after day I observe this compelling fascination that The Book of Knowledge has for children. Consistently it seizes any small spark of interest in a youngster's mind, and consistently it fans this into a deeper desire to learn.

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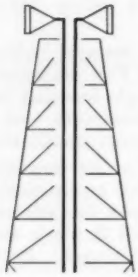
ST-O

What kind of men develop microwave highways?



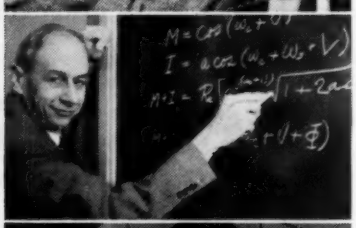
The great microwave systems that relay telephone conversations along with television programs from coast to coast will have to work harder than ever to meet growing demands for service. But at Bell Laboratories scientists have been making important advances in the art of microwave communication. These advances are being applied in the development of a new and more efficient system in which single beams of microwaves will carry simultaneously many more telephone conversations and television programs than is now possible.

The development of the new system demands the varied skills of men in many fields of science and engineering. Just a few of the specialists necessary are . . .

PHYSICISTS like J. A. Weiss, Ph.D. in Physics, Ohio State, to harness the properties of ferrites in new ways for better control of the transmission of microwaves.

MICROWAVE ENGINEERS like P. R. Wickliffe, M.S. in E.E., M.I.T., to design new circuitry. Microwaves must be conducted, controlled and amplified through waveguides which resemble pipes.

MECHANICAL ENGINEERS like W. O. Fullerton, B.S. in E.E., Iowa State, to embody new principles in designing the many structures and devices used in microwave telephony—with all parts feasible to manufacture, practical to install and easy to maintain.



SYSTEMS ANALYSTS like J. P. Kinzer, M.E., Stevens Institute, for over-all system planning and prediction. Mr. Kinzer works with numerical quantities and characteristics to predict on paper the performance of an operating system. What will it do? How must it perform to meet the needs?

ELECTRONIC ENGINEERS like B. C. Bellows, B.S. in Engineering, Cornell, for the development of "watch-dog" equipment to protect against failure. Protective devices must operate automatically in split seconds to maintain uninterrupted service.

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THE SCIENCE TEACHER

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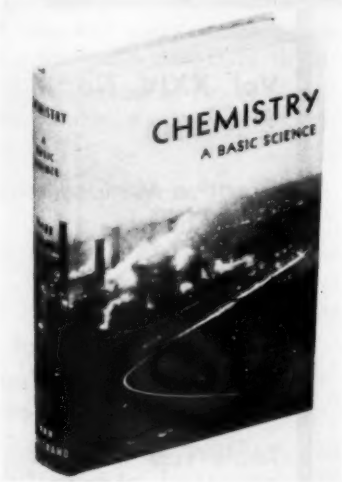

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- A Kansas State Survey on Secondary School Science Teachers
- The "Converted" Science Teacher
- The 1957 Science Achievement Awards for Students

I don't recall when last I read a book which struck with such force as Dr. George S. Counts' newest, *The Challenge of Soviet Education* (McGraw-Hill Book Company, Inc., New York, 1957. $6.00). Once started, I couldn't lay it down so ably does this distinguished scholar tell the frightening story.

It is true, of course, that other authors have presented much of the evidence in one way or another, emphasizing the implications of this or that aspect of the Soviet apocalyptic vision of the future. Dr. Counts, however, is probably as able a student of Russian history as any American today and, in addition, he is from "our own ranks"—now Professor Emeritus, Teachers College, Columbia University. His prefatory sentence sets the stage: "Soviet education (is) one of the great and inescapable realities of the contemporary epoch, and one which free peoples can ignore only at their peril." He says that "unless one grasps the broad sweep and controlling purposes of the effort on the part of the Bolsheviks to transform the peoples of the Soviet Union through *institutions and processes of education* (italics mine), one can scarcely comprehend intelligently any particular segment of the program."

And then he punches his message across, each point well documented and vividly illustrated—revealing the magnitude and power of Soviet education to control, not liberate, the mind of an entire society.

"The undertaking itself is so stupendous that it almost passes the understanding of anyone who thinks out of the educational practices and conceptions of any other society in history."

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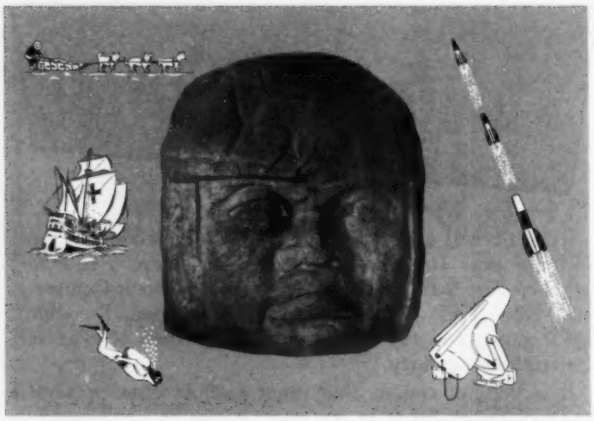
". . . the program announced in 1919 gives in broad outline the characteristics of Soviet education . . . (and) the conception of education as a political weapon."

". . . the great emphasis on science . . . serves the practical purpose of multiplying the material strength of the Soviet state and the eschatological purpose of defining the destiny of man" (Soviet concept, of course).

"Within a single generation the Bolsheviks have converted a backward country into a powerful industrial state. . . . they have already embarked on a program of technical and economic assistance to backward countries—a program which will doubtless grow in volume in the coming years. . . . All of this, in so far as it is genuine, means specialists, specialists, and more specialists. . . . If specialists are prepared beyond the defined needs of the domestic economy, they are prepared according to plan to advance the cause of Communism in the countries chosen for attention. . . . This new form of the outward thrust of Bolshevism is a product of the swift development of Soviet educational institutions."

". . . the task of meeting the challenge of Soviet

(Please turn to page 142.)



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THIS MONTH'S COVER . . . presents both the photographer's and the artist's views of highlights in Explorers Hall, located in the headquarters of the National Geographic Society just five blocks from the White House in Washington, D. C. A monument to man's daring and ceaseless efforts to find out the truth about his world, Explorers Hall contains colorful exhibits commemorating scientific explorations on land and in the sea, in the stratosphere, in jungles and desolate wastes, and in urban areas. The cover photograph shows a cast of a mammoth stone head which dominates one corridor of Explorers Hall. The original, some 2500 years old, was unearthed at La Venta in southern Mexico by a National Geographic–Smithsonian Institution expedition.

Open to the public weekdays without charge, Explorers Hall attracts some 7000 visitors a month. It is a favorite spot of the many student and other groups who visit Washington in the spring. For more about Explorers Hall, read the article of that title on pages 120 and 121 of this issue.

Looking ahead, the exploring scientist is certain to be concerned about problems of today for developing the scientists of tomorrow. That makes "On The Target," a special insert in this issue, of particular interest, as well as the lead article on the creative manpower shortage, starting on page 117.

The Achievement Test in High School Chemistry (see page 39, February *TST*), developed jointly by the Examinations Committee of the American Chemical Society and a special NSTA committee, is now available. The first cooperative test in the field of high school chemistry, the test consists of two parts. Either part covers the entire course and is equally valid. Each consists of 45 items and requires 45 minutes—or a total of 90 minutes for the two parts. Since the test is confidential and constructed for the use of high school teachers for the testing of their students, it is available only to bona fide high school teachers. It is, therefore, advisable to order it through the school system's official channels, in purchase order form bearing an order number. Inquiries and orders should be addressed to: Examinations Committee, ACS, St. Louis University, 1402 South Grand Blvd., St. Louis 4, Missouri.

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Readers' Column

The comments of Frank Sutman in the February Readers' Column can be carried further. He said that "gaining an understanding of the purposes and methods of research is far more important than learning the parts of the grasshopper." True—but we cannot have the first without the second.

The blithe but common assumption that we can teach understanding without learning is fallacious. Unless a youngster has a mind disciplined (oh, horrible word!) by learning the parts of a grasshopper, it will be very difficult to help him gain an understanding of the purposes and methods of research. Research is based on intellectual honesty and mental stamina and these are qualities which, unfortunately, cannot be gained except by hard work. Research's methods (about which we would teach our boys and girls) are based on painstaking, arduous, repetitious, and often dull work—much like learning the parts of a grasshopper—and, like learning the parts of a grasshopper, can lead to the wonder of understanding.

The successful teacher uses the learning process as a tool for the creation of understanding—the most priceless gift, for with it comes wisdom.

MIRIAM D. MANNING
Boston, Massachusetts

The program for the 5th National Convention is a beautiful thing. It is attractive physically and contains at least $150,000 worth of educational advancement for science teachers. As a past president of NSTA and chairman of the planning committee for the 1st National Convention, I particularly can appreciate the thinking and amount of work involved in developing the program. Congratulations to the NSTA staff and the committees which have done it.

NATHAN A. NEAL
McGraw-Hill Book Company, Inc.
New York City

This is somewhat belated thanks to the Future Scientists of America Foundation for its part in making last summer's Marathon Conference such a success (1956 Summer Conference for Wisconsin High School Chemistry Teachers at Appleton, Wisconsin). It made a tremendous impact on my enthusiasm for and attitude toward teaching.

There are special reasons for my writing this now. Last week I was delighted to learn that I had been given a National Science Foundation grant at the Institute for Chemistry Teachers in Las Vegas, New Mexico. The following day I received similar word from the University of New Hampshire.

I am convinced that had I not attended the Marathon Conference last year, I would not have had the interest and desire to make an all-out effort to obtain one of these grants. I regard this year as a turning point in my career. And I am sure that others who attended the Marathon and other conferences have felt the same.

I was pleased to note that John Baxter (Marathon Conference Co-director) will be at Las Vegas this summer. It was also of interest to me to learn that Dorothy Gifford (Special Consultant, Marathon Conference) is teaching a class at the New Hampshire institute.

RICHARD CROW
Marathon Fellow '56
Berlin High School
Berlin, Wisconsin

I have read with great interest the two reports in *The Science Teacher* ("Science Projects as Stepping Stones to Careers in Science," November; "High School Chemistry: Keeping the Course Up To Date," December) on the 1956 summer conferences co-sponsored by the Crown Zellerbach Foundation and the Marathon Corporation respectively. I believe this to be an excellent way of getting full value out of these work conferences. I have used my copies of the reports many times.

I shall look forward with enthusiasm to what project reports will appear next winter as a result of the 1957 summer conferences.

KENDALL PINE
Gilroy Union High School
Gilroy, California

Congratulations on the fine editorial on the salaries problem in the February issue of *The Science Teacher*.

We have recently had a legislative committee working on this problem. Your editorial certainly provides some ammunition we need, and I am taking the liberty of sending a clipping to the chairman of the committee.

HUBERT J. DAVIS
General Supervisor
Portsmouth City Schools
Portsmouth, Virginia

Having just finished reading the Editor's Column in the February issue, I'd like to give you a report.

Our school board has just adopted a new salary schedule starting at $4500 with an MA and going to $7200 after 17 years, with $300 additional for head of family. For those with 32 hours additional work in their field above a master's, we give $200.

You mentioned merit rating of teachers. For the first time, the department chairmen are being asked to rate each of their teachers on several items. This, we hope, will lead to the development of a merit program in the not too distant future. We in the adminis-

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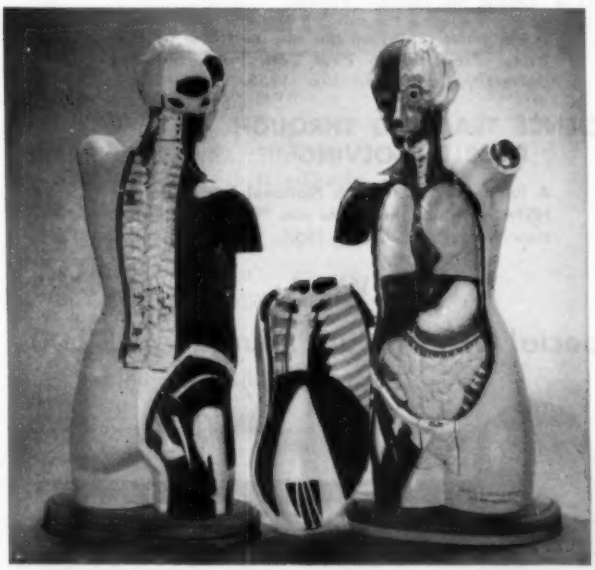

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tration have discussed merit many times during the past year.

At our last meeting of department chairmen, our superintendent made a statement almost identical to the one in the last paragraph of the Editor's Column —about consideration of the merits of a merit system. Industry does lots of research-type studies to get the answer; so must we. Our school boards may demand it if we don't. It was also pointed out that as salaries are increased, the community has a right to demand better teaching. They do in industry.

NELSON L. LOWRY
Dean, Township High School District 214
Arlington Heights, Cook County, Illinois

I have belonged to NSTA just one year but feel that it is the best value received from any teachers' organization.

Please send the Elementary School Science Bulletin; we are starting a grade school science program next year.

RAYMOND O. BANTLE
Fairport, New York

EDITOR'S NOTE: *The following letter was addressed to* A PENNSYLVANIA SCIENCE TEACHER, *whose letter regarding the December 1956 Editor's Column appeared in the February issue of The Science Teacher.*

I was eagerly awaiting the replies from the Editor's Column (December 1956) regarding the "provoking" biology teacher who started his year by depleting the local insect population. Thus, I was a bit disappointed in the lack of defense for this misguided comrade.

The natural environment of the classroom generally consists of human beings, cockroaches, and bacteria; and if you are getting your students outside and "into" their natural environment, you are probably embarking on a stimulating study of biology. Of course, we all realize the importance of supervised field trips but there are still a few "autocrats" around who feel that it is also worth-while for the student to make observations and collections without the "guiding hand."

Any father will testify to the spontaneous enthusiasm that erupts from his children after a trip to the zoo. They want to know *why*. A few additional years, a duck-bill haircut, and a hot-rod do not change these kids. It has been this teacher's experience that the "September Insect Collection" starts out as a great personal challenge to high school students, and the interest and enthusiasm created by contact with such a fascinating group of organisms does much in keeping interest high during those long winter months when we must, of necessity, rely on more sedate forms.

WILLIAM L. SMALLWOOD
Stillwater, Oklahoma
(Formerly Biology Instructor, Mountain Home, Idaho, High School; now at Oklahoma A & M on an NSF scholarship)

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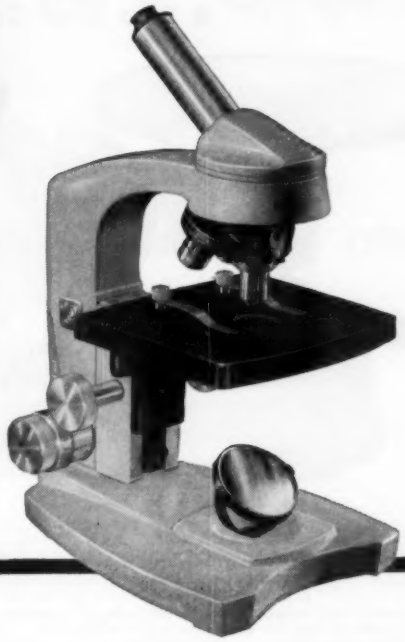

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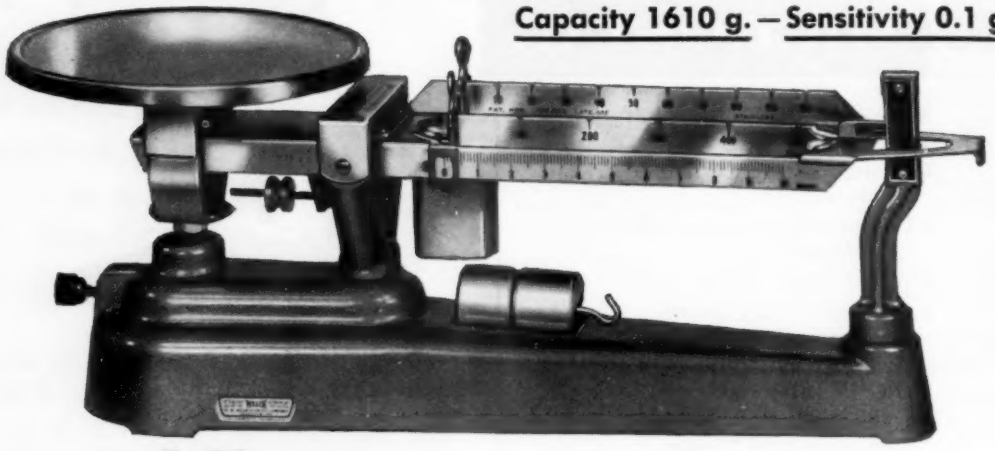

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CREATIVE MANPOWER

NOW and in the decade ahead

By Seymour L. Wolfbein

Chief, Division of Manpower and Employment, U. S. Department of Labor

This article is based on a talk presented February 19 at a discussion group meeting which was jointly sponsored by the American Association of School Administrators (AASA), the National Council for the Social Studies, and the National Science Teachers Association, during the 1957 convention of AASA at Atlantic City, New Jersey. The article is published here to present the economist's viewpoint on a problem of fundamental importance to science teachers —and to help give science teachers an intelligent base of operations in attacking the problem.

WHAT lies ahead in terms of the manpower supply and demand in the United States? This is one of the major problems challenging the field of education in general, and, in particular, the teacher focusing on educating the gifted child.

In accepting this challenge and in exploring and assessing this critical area of our manpower future, the educator underlines his goal. It is to develop the individual to the maximum of his talents, aptitudes, and interests. The educator also recognizes how this goal is allied with society's similar aim for the most capable workers across the occupational structure.

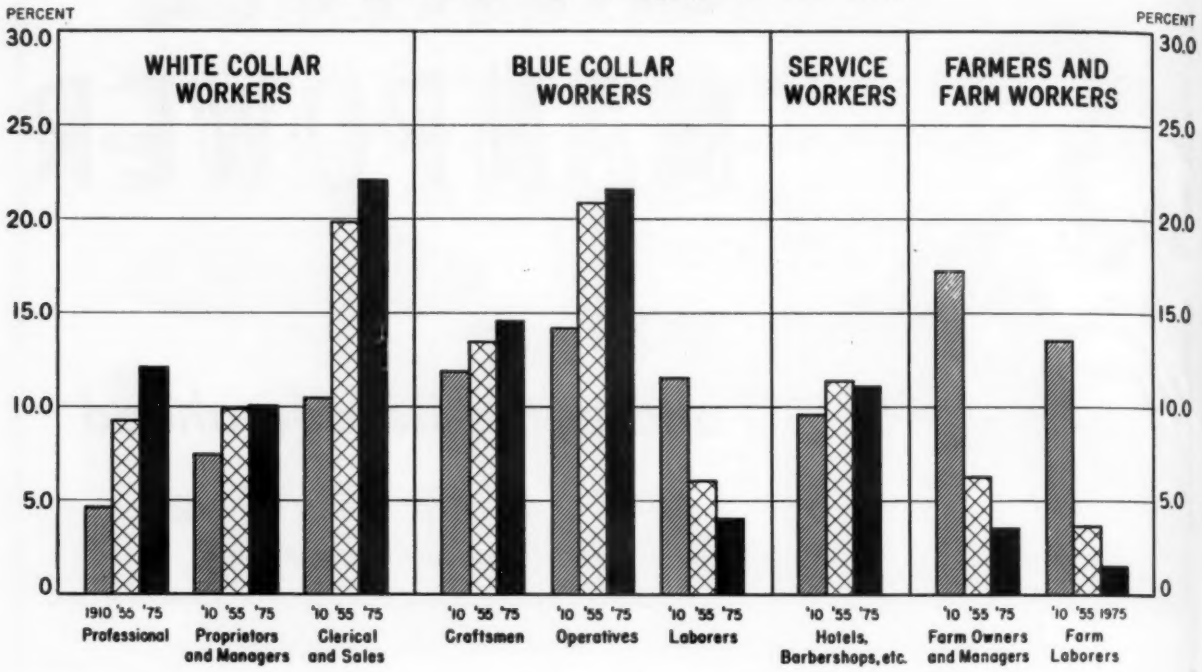
All of us are keenly aware of the manpower shortages we have now, not only for professional personnel like teachers, nurses, and engineers, but for technicians and skilled workers, and, indeed, for well-qualified persons in every occupational field. It is certainly a sign of intelligent planning to try to evaluate, against the background of today's problems, the major future trends in this field, especially since they will be the economic context or framework in which all of us who are interested in education—as teachers or administrators — will be operating for a long time to come.

Creative Manpower

Recent manpower developments have brought into extensive use (and often, perhaps, abuse) the term *creative manpower*. What do we mean by this term?

A generation or so ago, this question would have brought the practically unanimous reply that creative manpower refers to the artistic and literary professions—writers, sculptors, painters, composers, and the like. Today, it is a sign of our science-oriented age that engineers and scientists are the groups which first come to mind when we begin to talk about creative manpower. However, the term *creative manpower* cannot be limited to any one group alone. Our national security as

EMPLOYMENT IN THE MAJOR OCCUPATIONS
1910, 1955, AND PROJECTED 1975
Percent of Total Workers Engaged in Each Field



UNITED STATES DEPARTMENT OF LABOR
Bureau of Labor Statistics

Source: U. S. Department of Commerce, Bureau of the Census and U. S. Department of Labor, Bureau of Labor Statistics

well as the continued expansion of our economy depend in a significant and substantial way on new scientific discoveries and their engineering applications. No one can quarrel with that. But this should not overshadow the fundamental importance to our national welfare and survival of our form of government of the creative manpower needed in medicine, in teaching, in public administration, in the law, and so on.

Creativity, as a matter of fact, is needed throughout the occupational structure; it is not the birthright, the monopoly, or the unique need of any one occupational class. Where more do we need creative talent than in teaching, with its enormous impact on the growing individual? Or among skilled workers, who translate ideas and blueprints into actual forms for the factory production line? Or on the farm, where we now have employed the same number of persons as in 1870 —producing an enormously increased amount of food and fiber for a growing world population?

A definition of creative manpower, therefore, could run as follows: *Creative manpower represents those individuals, who, through their innovations, help us advance toward a higher standard of living and a higher level of national security.* They exist and are needed at every level of our society.

We also need to consider the term *shortage.* At this point, it is worth-while to remember that the United States has been a nation with manpower shortages throughout practically all of its history. Only during the '30's, when we and the rest of the world went through an extraordinary period of readjustment, was there any real long period of unemployment in the United States. We have been a country of enormous growth and change, building up an industrial plant of great technological efficiency, absorbing millions of persons from abroad, and supporting in an ever increasing standard of living a steadily growing population.

In what way, then, is the current period different from the other phases of our national history? The touchstone of our problem today is the *quality* of our labor force. When we use terms such as *creative manpower,* we are reaching out for words which will emphasize to everyone our critical need for more and better quality personnel in our labor force. In the studies we have and are now pursuing in the Labor Department, we, of course, come across numerical shortages in many occupations: in research and development, in

teachers for the elementary schools, in clinical psychology, etc. But what we hear just about universally in practically every single occupational field we study is the great need and demand for people at the top levels of knowledge, skill, and creativity.

For example, in a recent study on the shortages of scientific and engineering personnel in industrial research, many companies which had no immediate numerical shortage, nevertheless emphasized their need for scientists and engineers with more advanced training or better professional qualifications. A number of officials said they would be able to expand their research and development activities only if "well-qualified or better-trained persons" could be found.

That we should have this emphasis on quality is not surprising at all, if we remind ourselves that two important forces joined in the beginning of the second half of the 20th century to give us an unparalleled period of change. We have, on the one hand, a significant period of technological advance where we are actually crossing new thresholds in the sciences. If history is any guide at all, it is no wonder that we need every available top resource to cross safely the frontier of a new source of power.

Accompanying this technological advance is an equally unprecedented period of international stress. And, of course, it is again to the fields of manpower and technology that we have to look for the weapons which will help us achieve the final victory in this arena.

Put these two developments together and it is quite evident why, at this particular juncture of our history, we have the emphasis we are getting upon *quality*, upon *creativeness*, upon *leadership*—to help us move through this great period of change.

In the light of these developments, it is almost gratuitous to say that there is a particular sense of urgency for the optimum development of those whose abilities and gifts will enable them to fill the creative needs of our society.

The Manpower Outlook

Now, what of the future?

The Labor Department staff has recently completed a systematic analysis of future occupational requirements through a study of industrial employment trends and the changing occupational composition of each industry. Such work, of course, is in a sense always subject to change as new information on levels and trends becomes available. However, for our present purposes, we evolved the following question:

What will the occupational structure of the United States look like in 1965 and 1975, assuming a continuation of the basic trends that have been operating in this country during the first half of this century?

Focusing on 1965, we find, first, that the expectation is for an increase of about 25 million in the population of the United States over the next ten years—the equivalent of adding a city the size of Chicago to the United States about every 18 months for the next ten years. This expansion is

(Please turn to page 144.)

EMPLOYMENT IN THE MAJOR OCCUPATIONS OF THE UNITED STATES

(ACTUAL 1910 AND 1955—PROJECTED 1965 AND 1975)

	Number (in millions)				*Per cent*			
	1910	*1955*	*1965*	*1975*	*1910*	*1955*	*1965*	*1975*
Total	*35.5*	*61.7*	*73.1*	*83.2*	*100.0*	*100.0*	*100.0*	*100.0*
White collar	*7.9*	*23.8*	*30.5*	*36.6*	*22.3*	*38.7*	*41.6*	*44.0*
Professional	1.6	5.7	7.8	10.0	4.6	9.2	10.6	12.0
Proprietors and managers	2.6	6.0	7.3	8.3	7.3	9.8	9.9	10.0
Clerical and sales	3.7	12.1	15.4	18.3	10.4	19.7	21.1	22.0
Blue collar	*13.3*	*24.7*	*29.4*	*33.2*	*37.4*	*40.2*	*40.3*	*40.0*
Craftsmen	4.2	8.2	10.2	12.0	11.8	13.4	14.0	14.5
Operatives	5.0	12.8	15.6	17.9	14.1	20.8	21.3	21.5
Laborers	4.1	3.7	3.6	3.3	11.5	6.0	5.0	4.0
Service	*3.4*	*7.2*	*8.1*	*9.2*	*9.6*	*11.3*	*11.1*	*11.0*
Farmers and farm workers	*10.9*	*6.0*	*5.1*	*4.2*	*30.7*	*9.8*	*7.0*	*5.0*

Source: 1910 and 1955—U. S. Census Bureau
1965 and 1975—U. S. Department of Labor, Bureau of Labor Statistics (11/56)

A class of Maryland students inspects Hall exhibits.

Looking down one corridor of Explorers Hall toward the La Venta head: on the left, a special exhibit of the annual Newspaper National Snapshot awards; on the right, one of a series of photographs on the National Geographic–Palomar Sky Survey.

In the lobby outside Explorers Hall are several aquaria which quickly attract visitors. Here a group of school children are obviously fascinated by the goldfish.

THROUGH THE CENTURIES, in his desire to know the truth about the universe in which he lives, man has recorded—and continues to record—a succession of daring and brilliant scientific feats. Currently, both the scientist and non-scientist are waiting for the findings of the synoptic research to be done in the International Geophysical Year, which, to last 18 months, begins July 1, 1957. But there is a prelude to IGY—the explorations and scientific labors that have taught man enough about the universe so that he can launch such an event as IGY.

Part of this prelude is on public exhibit for the visitor to Washington, D. C. A record of much that has been accomplished is on display in Explorers Hall, in the headquarters of the National

Explorer

Geographic Society on the capital city's historic Sixteenth Street, just five blocks north of the White House. A continuing exhibit, Explorers Hall commemorates not only National Geographic Society explorations but also other scientific accomplishments.

The scope of the exhibit is wide—virtually as wide as the human thirst for knowledge. The displays deal with the bottom of the sea, the far reaches of the universe, the polar regions and steaming jungles, the stratosphere, desolate wastes and vast cities, primitive headhunters and great statesmen, prehistoric artifacts, and experimental aircraft.

Dominating one corridor of the hall is the eight-foot La Venta stone head, a cast of a mammoth carving unearthed in the state of Tabasco, Mexico by a National Geographic-Smithsonian Institution expedition to southern Mexico. The original, one of 11 carvings unearthed at La Venta, was left where found. Recent tests with radioactive carbon proved the heads date from between 800 and 400 B.C., instead of roughly 1000 years later as formerly estimated.

Another historic treasure in Explorers Hall is carefully preserved in a large glass wall case. It is the American flag carried by Admiral Robert E. Peary on all his polar expeditions. It is a graphic

ALL PHOTOGRAPHS ON THESE TWO PAGES
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testimonial to the explorations of the man who took it to unmapped regions. Worn, patched, and stained, the flag has gaps in it where pieces were cut out and left to mark man's progress into uncharted areas. The biggest missing piece, a segment running through stars and stripes from upper left to lower right, was left at the North Pole itself, which Admiral Peary was the first man to reach.

The flag was made for the Admiral by his wife who donated it to the Society for safekeeping shortly before her death in 1955.

Along one side of the Hall are giant enlargements of plates from the farthest-reaching map photographs yet made. Recently completed, it is the world's first comprehensive atlas of the heavens. It is a chart of the universe developed in a joint Sky Survey undertaken by the Society and the California Institute of Technology's Palomar Observatory. Begun in 1949, the Survey took seven years to complete. Using some 2000 photographic plates, this sky atlas charts the universe to the incredible distance of a billion light years (one light year is about six million million miles) from Earth. Copies of the sky atlas are being supplied to observatories and institutions throughout the world.

Hall

Explorers Hall also presents mementoes of the work of two scientists who have successfully penetrated one of the last great frontiers of science—the ocean depths. One is William Beebe, whose expeditions were co-sponsored by the Society. His Bathysphere is represented by a quartz window, three inches thick, which safeguarded him against the tremendous water pressures 3000 feet down. The other is Captain Jacques-Yves Cousteau, co-inventor of the Aqualung. Two ancient Greek wine jars, which he brought up from the floor of the Mediterranean Sea during a Society-*Calypso* expedition, are on display in the Hall. The jars were in a cargo ship sunk around 230 B.C.; when found, a few still held wine dregs.

The art and science of color photography, which the Society has done much to develop, are also featured in the Hall. Dye-transfer process enlargements of outstanding color pictures taken by Society staff photographers line the walls. In subject matter, they range the world, from pole to pole and from jungle savages to world statesmen. Thousands of color plates from the National Geographic Magazine are displayed on hinged screens, representing the Society's work in far corners of the world for nearly half a century. An automatic projector throws on a screen, color slides selected from the Society's file of about 60,000.

Explorers Hall, which attracts some 7000 visitors monthly, also features special temporary displays. It is closed Saturdays, Sundays, and most holidays, and is open to the public free of charge from 9 a.m. to 4:30 p.m., Mondays through Fridays.

A visitor inspects the Cousteau-Gagnan Aqualung (with U.S.-type compressed air bottle), foot flippers, and face mask similar to the equipment used by divers of the National Geographic Society–*Calypso* Marine Archeological Expedition. Next to the diving equipment in Explorers Hall are two ancient Greek wine jugs recovered from the bottom of the Mediterranean Sea by the expedition.

A group of younger visitors studies the relief map of the Western Hemisphere and the Pacific which decorates the lobby floor outside Explorers Hall.

PLANTING THE SEED OF INTEREST

A Report on an Introductory Course in Physics and Chemistry

By ROBERT L. GANTERT and DALE HUNTER

Science Teachers, Alexander Hamilton Junior High School, Seattle, Washington

WHILE it might seem, to some, unfair and unwarranted to say that science is the most vital field of study today, it should be recognized that this area offers tangible and satisfying rewards for qualified youth. In the past decades, our nation has seen a tremendous increase in the momentum of technology. More and more young people of high ability are needed to carry out and develop plans for human progress. Until recently we have been content to use the few scattered scientists who have, by hard work and good fortune, graduated from colleges and universities. Now we must plant the seed of interest early to reap an adequate harvest in time. Junior high school students are capable of cultivating an active interest and of also promoting this interest by inspiration and mature thought. This is our conviction and without it, a program of the type described here would be worse than useless.

The crying need for encouraging young potential scientists to develop their aptitudes in the field of physics and chemistry acted as the primary incentive for our project. We hope that, in some small way, this brief introductory course may have struck an active chord in the young minds of the 20 exceptional science pupils engaged in this experimental project.

This extracurricular course in elementary physics and chemistry was organized and initiated at Hamilton Junior High School in Seattle, Washington. Louisa Crook, Director of Science Education for Seattle Public Schools, worked with us in an advisory capacity until the project was completed.

The class was limited to the top 20 9th-grade science pupils at Hamilton. The selection of these pupils was based largely on their past academic record in junior high school science. The length of the course was five sessions of 1½ hours each, held one day a week after school hours. The fifth and final session was an organized class visit to the physics and chemistry laboratories at the University of Washington. Here the 20 pupils of the experimental group had an opportunity to observe laboratory classes in session. Various pieces of scientific equipment were shown and explained to the group by the college instructor. Professors Bryan T. McMinn and Frank Rhodes, of the mechanical and civil engineering departments, also demonstrated many unique devices used in their higher education groups. The trip was designed to show the pupils what they themselves might use and study at some time in the future.

A ten-minute explanation of the over-all operation of the huge cyclotron was given by a guide, who then conducted the class on a tour of the impressive cyclotron building itself. The glass-blowing shop, the audio-metric research laboratory, and mass-spectrography exhibits were also included in the tour. The visit lasted far beyond the time originally scheduled. The great interest of the members of the group in the physical science equipment displayed, together with the questions asked, was a reward in itself.

Here is a brief survey of the initial introductory course at Hamilton.

The four sessions prior to the forementioned visit revolved around 40 illustrated card experiments which were completed by the 20 selected pupils during the four sessions. When a pair of students had completed any of these experiments, their results were observed and their conclusions

ROYAL C. CROOKS

Author Gantert and two of his students show a six-foot baby reticulated python displayed at the annual science fair last fall. A section at the fair was given over to unusual wild animals.

checked for accuracy. Ten of these card experiments were displayed, together with the scientific equipment needed for their work, for a week prior to each scheduled session. The school's showcases were reserved for this purpose. The individual experiments varied in their complexity and all included in the demonstrations a basic principle of physics or chemistry.

The members of the group worked in pairs similar to the laboratory procedure used in most high schools. When the instructor and pupils were satisfied with the results and conclusion of the experiment, the team could then move on to another experiment, and so on, until all ten experiments had been completed. There were no tests, grades, or homework connected with the course. The idea of the course was merely one of introducing to the pupils the practical application of high school science principles in following through an experiment to a definite conclusion.

The role of the two instructors was reduced to that of supervisory status. The pupils did all the laboratory work themselves while the instructors merely circulated around the room, answering questions and lending a helping hand whenever desired. Each card experiment contained a complete listing of the *Problem, Materials, Procedure, Results,* and *Conclusions*. All the pupils had to do was to perform the illustrated experiments and trust that his or her conclusion agreed with the listed, proven results, etc. As was to be expected, even among the better pupils, several accidents occurred during the class procedures. One of the girls received a bad burn from spilled hydrochloric acid, another became ill from inhaling chlorine gas, and the top of one of the laboratory tables was badly scarred by a chemical reaction which went out of control. However, none of these mishaps was of a serious nature.

During the first week of school in early September, we displayed a total of 37 simple "Do It Yourself" experiments for the general student body to try at home. These simple experiments did not involve the use of any real scientific equipment and extra credit was given by the various science teachers for satisfactory completion of the more difficult ones in class. Thus, we tried not to neglect the average pupil who was not selected for the special class. The local newspaper gave our venture publicity and the Seattle School Administrative Center compiled and distributed mimeographed copies of the experiments we used to all the other junior high school science departments in the city.

EDDY J. MANNERY

The Hamilton School's annual science award program is held each year for outstanding science pupils in the 7th, 8th, and 9th grades. About 50 pupils in each of the three grade levels take the science aptitude test which is compiled by the Hamilton science teachers.

Complete mimeographed copies of both the "Do It Yourself," as well as the 40 experiments used in the introductory course, may be had by writing to either Alexander Hamilton Junior High School Science Department or Mrs. Louisa Crook, 815 Fourth Avenue, North, Seattle Public School Administration, Seattle 9, Washington. If your junior high school is a poorly furnished one as far as science equipment is concerned, you could either borrow the needed materials from your high school science department or vary the experiments to meet your own physical setup. In any case, the primary objective, regardless of the degree of magnitude, is to help find, in every possible way, an answer to the vital question, "Where are our young scientists?" We hope that some of you junior high science teachers will take our neophyte offering and build it up to worth-while proportions. With this thought in mind, may we ask your valued advice and assistance in this undertaking?

AUTHORS' NOTE—A similar project is under way at Roskruge Junior High School, Tucson, Arizona. However, due to limited facilities, a report is still pending. Principal Frank Ott has written us that their science department is using the materials we forwarded to them.

By JOHN STERNIG

Assistant Superintendent, Glencoe, Illinois, Public Schools

MODERN EDUCATION says, "Give children first-hand experiences if you want lessons to stick." This is no doubt true also for adults. Everyone seems to learn best when learning comes from experience.

Learning about volcanoes is no exception. Volcanoes fascinate children and grownups but very few can actually go to see a real one. Movies offer a good secondhand experience but it's possible to have a volcano erupt right in your own home or classroom—in miniature, of course.

All you need are some pieces of orange crate lumber, some old window screen, a piece of tin can, some wheat flour paste, asbestos powder, sand, plaster of Paris, and one chemical—ammonium bichromate in crystal form.

The accompanying sketches show the steps of construction described.

1. Start with the end piece of an orange crate or a piece of ¾-inch plywood about a foot square. (Figure 1)
2. Take an empty tin can and with tin shears cut a piece about 3½ inches wide and 4½ inches long. Cut a series of ¼-inch slits along one of the long sides. Bend the sheet of tin into a cylinder around a broom stick. Bend the tabs out along the slitted end. (Figure 2)
3. Place the cylinder in the center of your baseboard and tack it to the board through the tabs. This becomes the tube and crater of the volcano. (Figure 3)
4. From another piece of orange crate lumber, cut eight pieces in the shapes and sizes shown on the drawing. These will form the foundation for the sides of the mountain. They are nailed to the board in position against the cylinder of tin. (Figure 4)
5. Take some window screening, cut it to fit, and tack it to the base and onto the wooden mountain sides. Press it into the various contours which you have decided your mountain should have. (Figure 5)
6. Now take the wheat flour paste and asbestos powder (obtainable from a hardware store). Mix the wheat flour in a pan with water until it is the consistency of cream. Add and mix enough asbestos powder until it reaches a clay-like consistency. Then spread the mixture over

your mountain and the baseboard, modeling the form to your own satisfaction. Leave the crater open.

7. Before the mixture dries, sprinkle some sifted sand all over the mountain and the baseboard. Pat it into the surface. This gives the mountain a realistic appearance and texture. Then let the model dry.
8. When it has dried, take plaster of Paris (also obtainable in a hardware store). Spoon the plaster of Paris into several ounces of water and stir until it reaches a consistency which permits it to flow but not run. Fill the tin cylinder about half full of this mixture. This gives a plaster bottom for the eventual eruption. Also flow the plaster down the sides of the mountain by pouring it on the mountain top next to the crater. It makes a very realistic "lava flow." (Figure 6)
9. When all this has hardened and dried, you can paint your model volcano. The plaster lava flow is painted red at the crater and darker down the sides until it becomes gray in the valley to simulate hardened lava. The sides of the mountain are painted rock and earth color or, if your sand coat looks realistic enough, you may wish to leave it unpainted.
10. Now for the eruption. Once your paint has dried you fill the crater with crystal ammonium bichromate. For a crater of the size described here, this will be a couple of teaspoonsful. The chemical is lighted with a match and your eruption begins. Each crystal glows and the gases generated cause the glowing crystals to erupt from the crater where they produce a fall of volcanic ash many times the volume of the chemical in the crater. This ash is deposited on the sides of the volcano where it forms a slope characteristic of volcanic mountains.

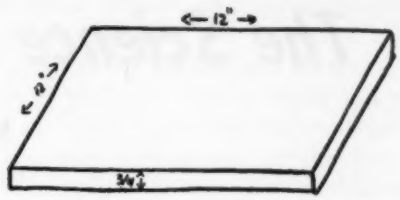
The eruption continues for several minutes simulating very realistically the life of a real volcano with alternating periods of active eruption and dormancy as the crater fills up and is blown clear by the internal combustion. Even the ashes are true to scale as they are hurled into the air several times the height of the mountain.

There is no danger involved in this eruption since the chemical is slow burning and since all parts of the volcano where it burns are plaster coated.

Eventually the eruption subsides as the chemical is either burned up or the fire smothered by a filled crater. The volcano is then extinct until next time.

A volcano such as this makes a fine science project for home or school and becomes a worthwhile teaching tool when it is finished.

Figure 1.



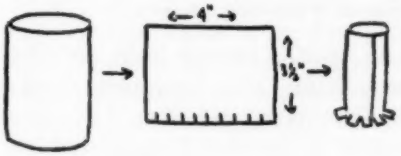
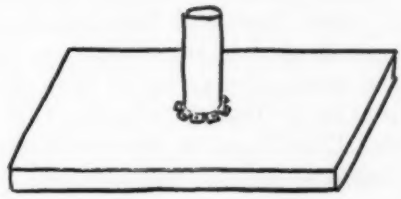


Figure 2.

Figure 3.



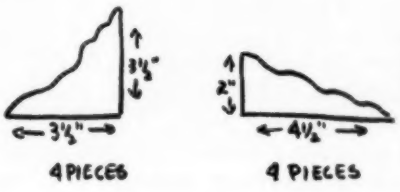


Figure 4. The precise dimensions and contours should vary from piece to piece.

Figure 5.

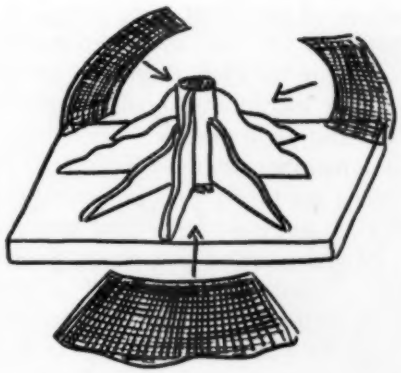


Figure 6.

The Science Club and Science Projects

By SISTER MARY STEPHEN, C.S.J.

Monsignor Luchey High School, Manhattan, Kansas

This article is based on a report made by the author at summer school last year at Kansas State College, Manhattan, on the science club she sponsored in Boonville, Missouri.

THE SCIENCE CLUB HAS PROVED to be an effective means of stimulating and developing science interest in youth. This report describes the organization and structure of the club I sponsored, the work done by the students, my experiences with the boys and girls, and the results obtained.

Membership in the Chi Beta Phi Science Club at Saints Peter and Paul School, Boonville, Missouri, is open to any student interested in science. The usual membership is from 30 to 40 students from an average enrollment of 65. In the school year 1955-56, about two thirds of the group were freshmen and sophomores and one third were juniors and seniors, with an equal distribution of boys and girls.

The objectives of the club are to create activities in science. To show the need for scientific writing, a student is appointed club reporter. A girl is chosen as club librarian and thereby gains practical experience in science library work. The club historian keeps an accurate record of all club activities. The position of laboratory assistant is given to one of the more promising students in order to promote his initiative and ability. The four elective offices of president, vice-president, secretary, and treasurer are held by upperclassmen.

Within the club, there are interest groups which include astronomy, geology, physics, radio, biology, and photography. There may be from two to nine members in these groups.

The freshmen who are members of the science club do not have individual interests in science, so it has been found that group project work in connection with their general science classwork is most helpful. Science can be an exciting challenge for youngsters. What is happening around them will interest them the most.

At the beginning of the school year, the students are asked to bring a cigar box and a jar to school. After showing the class how to pin an insect on a piece of corrugated cardboard and how to make a killing jar with a little carbon tetrachloride, they are given the assignment of capturing, killing, and mounting ten insects within a week's time. The insects are placed in the cigar boxes which have been lined with cotton and a few mothballs. The insects are kept there for further study and, finally, the individual collections are put together for a group project for Science Night.

At the same time, each student is asked to collect leaves from ten different trees, jotting down the location of each tree. The leaves are pressed in an old mail-order catalog in preparation for mounting.

Early fall is excellent for rock and fossil hunting and this project extends over several months, each student keeping the rocks and fossils which he finds. Interest never seems to wane in this project, as the countryside is abundant with fossils, and there is a certain satisfaction about learning the history of the earth from rocks.

The latter part of October, all the boys in the class are given the assignment of building a small motor. The older lads in school further interest and stimulate the idea of accomplishment by giving experienced advice. All kinds of questions come to their minds about the how and why of magnetic fields, electric currents, and so forth. The boys usually do not succeed with their motor and without any urging go on to build a better one. When they do come to the unit on electricity and magnetism, it is then interesting for them; and, from this simple study of motors, some lads will go on to complicated projects and try out new ideas.

Girls are not interested in motors, so while the boys are working on motors, the girls are started in photography. They take, develop, print and learn how to enlarge pictures. An older student, interested in photography, helps them with their work. Each girl keeps her best prints and enlargements for Science Night.

It has been found that it is never good to use actual class time for any projects, with, perhaps, the explanation of the work to be done, or a laboratory period spent on a simple project. Project work is fine only if it supplements the regular classwork not supplants it.

The students have a natural interest in science which spurs them on to developing special skills and an interest in modern scientific developments which also stimulate classwork.

On Science Night, this sophomore student shows the rocket he constructed. He and four of his classmates wrote to industrial firms which make guided missiles to get information to help them design model rockets.

These assignments may not be correlated with the beginning chapters of the general science textbook. Yet, when the class is ready to study the unit on the natural and physical sciences, they have a background and experience that are invaluable.

After semester examinations, the boys usually start working on a crystal radio set. Unless the school is located near a radio station, this is not a good project. The only thing that they are allowed to buy is a crystal; the rest of the set they must make for themselves.

Astronomy interests girls while the boys work on their radios. Here, the projects are kept quite simple. One is to make a poster showing the planetary system. The planets are made from highly-colored felt paper and are in proportion as to size and distance from the sun. Simple charts of the Milky Way or other galaxies are made on dark poster paper with glitter pasted on for stars. A poster of the universe can be made showing the position of the galaxies with respect to one another.

Although the boys and girls work on different projects at times, it is surprising how much they learn about one another's work by observing what their neighbor is doing.

While studying physiology, a laboratory period or two is taken for making biological models. The class is divided into groups. One group makes a heart, another an eye, and a third group an ear. The models are made of wire and papier-mache and then painted with tempera.

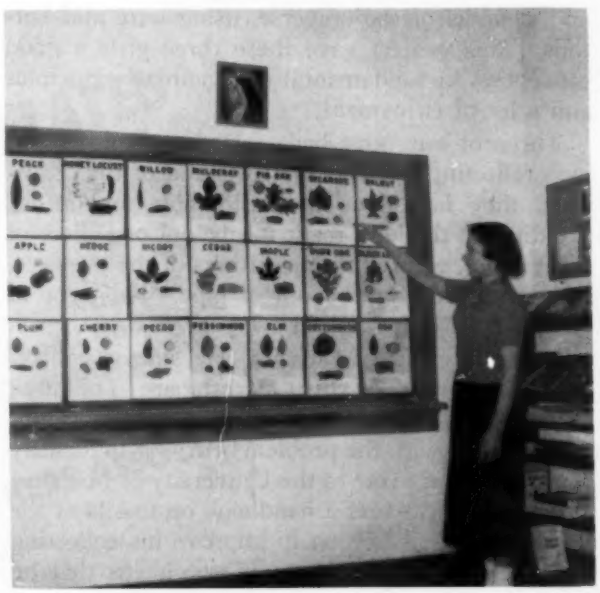
These group projects do not have to be stereotyped from year to year. A teacher must know the resources of the community and the students' interests, and then plan a program for the year. One of the most important things is to capitalize on interest. For example, the little town in which this school is located is situated on a high bluff overlooking the Missouri river. Procuring contour maps of this region from the United States Geological Survey and making a relief model of the town, the surrounding countryside, and the river, was an excellent project for stirring up interest in earth sciences.

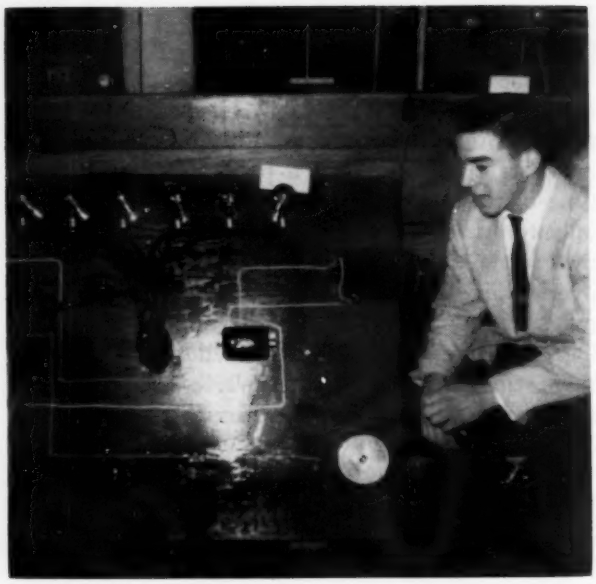
Sometimes the regular laboratory work of the freshmen, such as crystal making, electroplating, making blue prints of magnetic lines of force, etc., provides displays for Science Night, too.

The upperclassmen are the backbone of these projects and some of them participate in club activities with the specific motive of helping to prepare themselves for college work. Therefore, a different approach to project making is followed.

During the school year (1955-56), the science projects were varied. Irene, a sophomore, is interested in trees. She collected leaves, a piece of the bark, a cross section of a limb, and seeds from the trees of this region, and then made a separate mount for each tree. To continue her project next year, she wants to study the pests that attack these trees.

This sophomore student's display represents two years of study of trees in the area.





This is part of a model showing the wiring in an automobile which this junior class student exhibited on Science Night.

Three of our sophomore girls became interested in astronomy as freshmen. They were determined to build a moving model of the planetary system. The model was scaled as to astronomical sizes and distances, but had to be modified to make it fit within the boundaries of a suitably sized framework. One of their original ideas was to control the speed of each planet, but they could not work this out; so all the "planets" made about four rpm's about the balloon "sun." As they met each Saturday morning, they thought of ideas (one of their mothers was very adept at helping them) on how to devise a model of the Milky Way out of foamite and a model of the universe, using wire and buttons. This project gave these three girls a good conception of fundamental astronomical principles and a lot of enjoyment.

Three of our boys had started to build a six-inch reflecting telescope. At the end of the school year, they had done a considerable amount of grinding on the lens, made a tube out of a piece of sheet metal, worked on the fittings of the eyepiece, and fashioned a tripod out of pipe. This type of project is hard to finish in one year.

Jim is interested in fossils. He started collecting them at random when a freshman. The more he collected, the more curious he became about them. Faced with the problem of trying to identify local fossils, he wrote to the University of Missouri for help and was sent a handbook on fossils of the region. This led him on to improve his collecting techniques and to take care of specimens that he had found. At present, Jim is planning to study geology after leaving high school.

One of the junior girls became quite interested in crystals and their formation. Her project entailed growing as many kinds of them as possible. She went from this stage to studying their physical characteristics with the microscope. Perhaps this project was important in her decision to become a medical technologist after leaving high school.

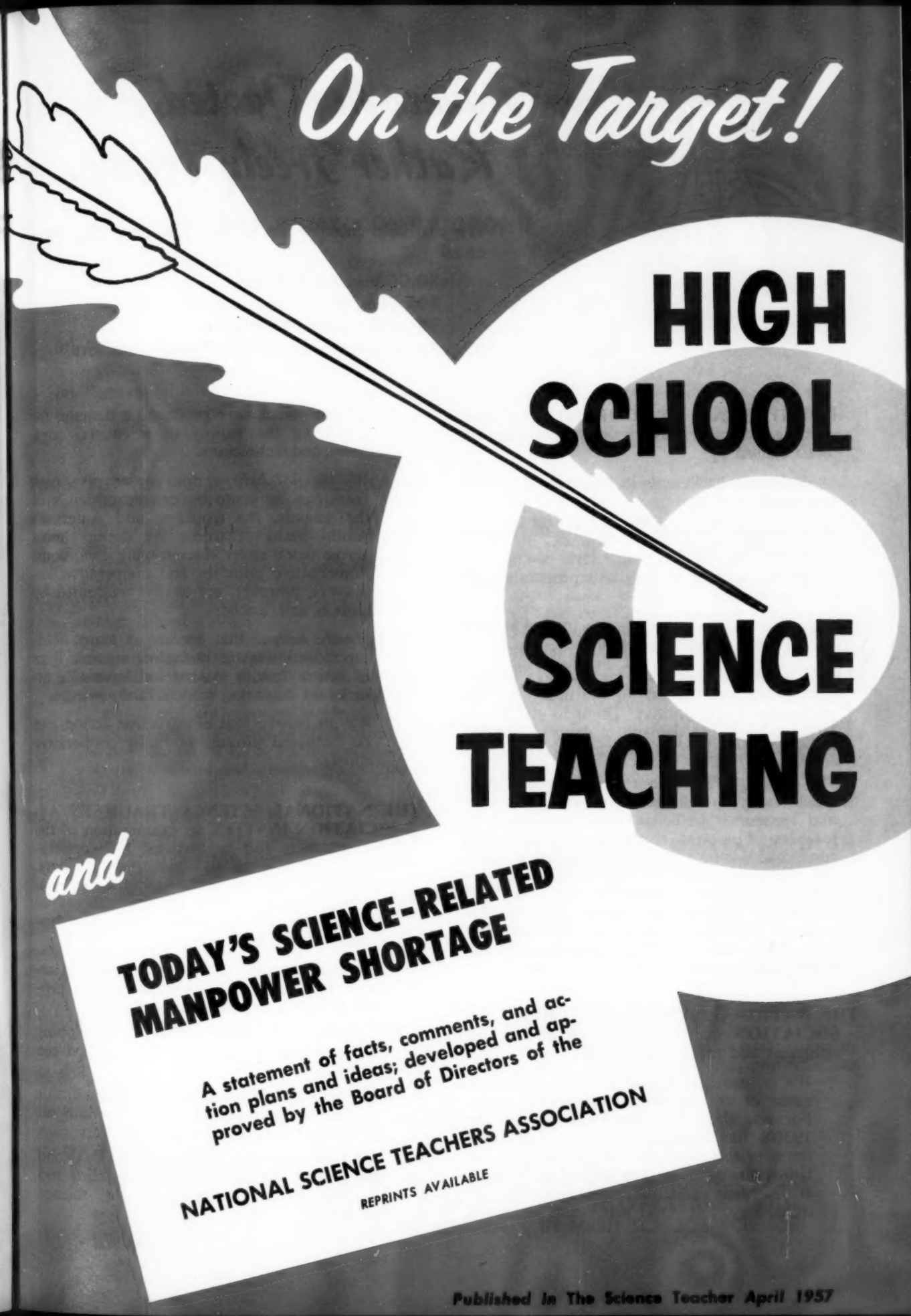
Elaine liked radioactivity even as a freshman. Her project was simple. She fixed a box so that a piece of radioactive material could be clamped at the top and a piece of film inserted at the bottom. Over the film she would place different kinds of metal and expose them for varying lengths of time. She developed all of the negatives herself. The intensity of the print gave a relative measure of the radioactive material showing the penetration of the different kinds of metals. Elaine is now contemplating further experiments.

Six of the sophomore boys decided that they would like to model rockets and guided missiles, so they wrote to all the big companies that make rockets and asked them for pictures and specifications providing the public could have them. The companies sent the boys as much material as they could, which, in almost every case, included a lot of vocational material. This encouraged the boys very much, and they started to work with a great deal of enthusiasm to build models of such rockets as the V-2, Honest John, Corporal, etc. It was a simple project for them, but one that could lead into other fine projects of a similar nature.

One of our junior girls is quite interested in photography. She has made a study of all the factors that affect a good enlargement. Mary Beth's interest in photography is contagious and she has helped many of the younger students to become interested in this field.

Another lad, a junior, wanted his project to be very practical, so he has made a study of the soil on his farm for the last two years. He made chemical tests on the soil to see what percentage elements were present and made moisture content tests, tests for organic matter, etc. Next, he planted the crops usually grown on his farm on two plots of ground, one treated with chemicals, the other not treated. After getting these results, he began to study the morphology of the land to see how it might be improved. No doubt he will be farming this land some day and this project will be an immense help to him.

(Please turn to page 150.)


On the Target!
HIGH SCHOOL SCIENCE TEACHING
and
TODAY'S SCIENCE-RELATED MANPOWER SHORTAGE
A statement of facts, comments, and action plans and ideas; developed and approved by the Board of Directors of the
NATIONAL SCIENCE TEACHERS ASSOCIATION
REPRINTS AVAILABLE
Published in The Science Teacher April 1957

Figures Are Quoted Rather Freely Today . . .

We are told that in the United States today we need

50,000 more scientists
100,000 more engineers
???,000 more technicians
X,000 more qualified science teachers

ALSO, IT IS SAID BY SOME that our present shortage of scientifically trained manpower has been caused by

- declining enrollments in high school science courses
- downward trends in the quality of teaching in science classes
- lack of science courses and proper content in many high schools
- indifference of today's youth toward science and other quantitative studies

LET'S AGREE—there is a big shortage of persons technically trained for the many job opportunities existing today. There *is*—NOW—a large and growing demand, a demand that far exceeds supply; of that, we can be certain.

BUT—the causes of the shortage have been "identified" easily and differently by various writers and speakers. Criticisms have been fired at teachers of science—high schools have been condemned—youth have been labelled as mentally lazy and indifferent. However, such criticisms are neither constructive nor ON THE TARGET. Perhaps the current large demand is partial evidence of the *success* of science and technology—and of science teaching—in our industrialized society.

THE NATIONAL SCIENCE TEACHERS ASSOCIATION questions many of the current criticisms and facile explanations.

► *We do not believe* that there is any *single* cause of our present manpower situation. For one thing, the low birth rate of the 1930's has resulted in about 1,000,000 fewer people in the 17-24 age group in the United States today than we had in the mid-40's. Meanwhile, the rapid expansion of technology, the "cold war," and increased military needs have produced a demand far exceeding the supply of scientists, engineers, and technicians.

► *We do not believe* that constructive progress can be made by caustic criticism of the schools, the teachers, and America's youth—many of whom are doing almost heroic work under discouraging conditions. Constructive criticism and cooperative endeavors, however, are always welcomed by schools and teachers.

► *We do believe* that leaders in many fields are more interested in finding sensible lines of action than in making indiscriminate attacks on teachers, schools, and colleges.

► *We do believe* that constructive action can be furthered through mutually cooperative effort.

THE NATIONAL SCIENCE TEACHERS ASSOCIATION INVITES an examination of the following facts and suggestions: the cooperation and support of all—individual teachers, leaders in scientific societies, executives in business and industry, labor leaders, officers of foundations, legislators, parents, leaders of professional groups, and others

- in making suggestions for furthering the actions suggested in this booklet and in proposing and developing others
- in making substantial grants for developing and carrying out projects that are "on the target"
- in working with school and college officials to improve and extend pre-service and in-service preparation of science teachers
- in cooperating with boards of education and the general public to increase salaries and improve working conditions for science teachers

High School Science Enrollments

may be better than you have been led to believe.

HERE ARE SOME COMPARISONS	1900	1954
(a) Total youth aged 14-17 in. U. S. population	6,131,000	9,011,000
(b) Total enrollment in grades 9-12 (public schools)	500,000	6,500,000
(c) Actual enrollment in....high school physics	98,846	302,800
....high school chemistry	40,084	482,700
(d) Per cent (c) is of (a).....for physics	1.6%	3.4%
.....for chemistry	0.7%	5.4%
(e) Per cent (c) is of (b).....for physics	19.0%	4.6%
.....for chemistry	7.7%	7.3%

FROM THE ABOVE DATA we see that during the period 1900-1954 there has been:

- a 50 per cent increase in total U. S. youth aged 14-17
- a 1200 per cent increase in youth enrolled in grades 9-12 in public schools
- a 200 per cent increase in *actual* enrollment in high school physics
- an 1100 per cent increase in *actual* enrollment in high school chemistry
- multiplication by a factor of two, the *per cent* of *all* U. S. youth aged 14-17 who are *in school and are enrolled* in physics
- multiplication by a factor of eight (nearly), the *per cent* of *all* U. S. youth aged 14-17 who are *in school and are enrolled* in chemistry

SOME OTHER FACTS ARE

(a) In 1900, physics was offered usually as a required 10th-grade course; today, physics is offered usually at the 12th-grade level and as an elective; in the smaller schools, physics is commonly alternated with chemistry in the 11th and 12th grades.

(b) In 1954-55, about 23 per cent of high schools having the 12th grade offered neither chemistry nor physics; these schools enrolled about 5.8 per cent of all 12th-grade high school students. It thus appears that nearly 95 per cent of all students reaching the 12th grade have the opportunity to take chemistry and physics.

(c) An examination of enrollments at each grade level where the subjects are offered showed in 1954-55: the equivalent of about three in four 10th-grade students (72 per cent) taking biology, one in three 11th-grade students (32 per cent) taking chemistry, and one in four 12th-grade students (23 per cent) taking physics.

(d) In the past three decades, general science has become one of the major subjects in grades 7, 8, and 9. Practically all students take at least one year of general science; about three in four students also take one year of high school biology.

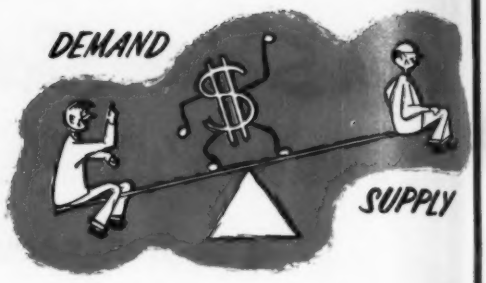
(Sources of above data: U. S. Bureau of the Census and publications of the U. S. Office of Education)

STUDENT ENROLLMENTS IN HIGH SCHOOL SCIENCE can be further stimulated by

- inspired, better teaching of science in elementary and junior high schools
- improvements in science course content, activities, and sequence in grades 1 through 12
- improved facilities—such as laboratories, libraries, and project rooms
- better guidance and career information by teachers, counselers, parents, and scientists and engineers in the community

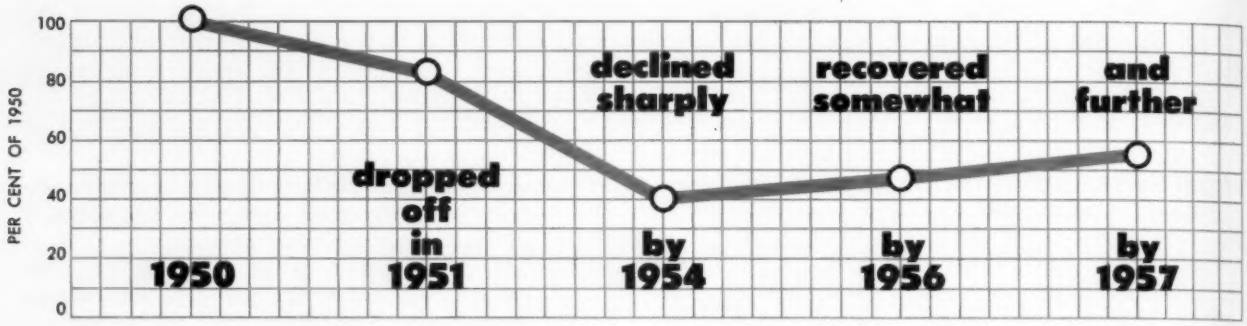
TO REVISE AND STRENGTHEN SCHOOL SCIENCE PROGRAMS SO THAT THEY WILL ATTRACT AND HOLD MANY MORE STUDENTS IN HIGH SCHOOL SCIENCE

The Supply of Qualified Science Teachers



has been down drastically but is now recovering slowly.

TAKING 1950 AS THE BASE YEAR, the number of college graduates prepared and certified by state agencies to teach science



IN SEPTEMBER 1955 a study by the National Education Association's Research Division showed

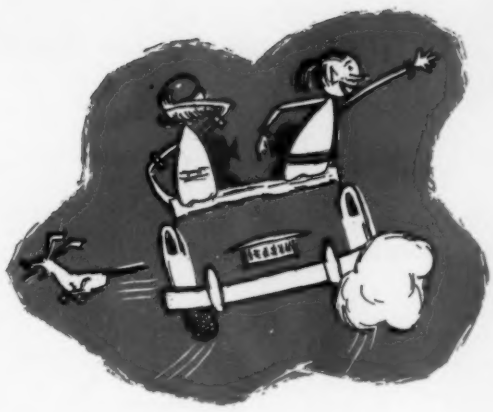
- the number of new teachers prepared and available to teach PHYSICS was 50 per cent the number who could have been employed (that is, 50 per cent below the "demand" for new physics teachers)
- the number of qualified new CHEMISTRY teachers available was ten per cent below demand
- the number of new teachers prepared and available to teach GENERAL SCIENCE was 52 per cent below demand
- MOREOVER—only about 56 per cent of the newly certified science teachers graduated in June actually accepted teaching jobs in September. Of those who did not enter teaching, many took jobs in industry; some entered military service; a few continued with graduate studies.

THE DEVELOPMENT OF INCREASING NUMBERS OF SCIENCE TEACHERS can be encouraged . . .

- The supply of teachers available to local school systems can be increased by efforts of school boards and citizens' groups to *improve salaries* (and/or moving to 11-12 months of employment) so as to provide effective economic competition with the salaries now offered by business and industry.
- The retention of science teachers can be enhanced by *improving their conditions of employment*. Science teachers lack equipment and instructional materials; they lack *time* to plan for laboratory teaching and to work with superior students; many want refresher courses during the year and in the summer; some could make effective use of laboratory assistants.
- A more intensive effort is needed to increase the number of high school and college students who are planning to prepare for science teaching. This effort should be made by high school science teachers, counselors, industry, and college professors *in science* as well as in science education.

CHANGES MUST BE MADE IN CONDITIONS OF EMPLOYMENT TO ATTRACT AND HOLD QUALIFIED TEACHERS BOTH IN HIGH SCHOOLS AND IN COLLEGES

American Youth Has an Interest in Science . . .



Clichés about the irresponsibility of youth date back centuries. Today the stories persist—even though they apply to a small per cent of the total. In actual fact our young people are rather exceptional in many ways—not the least being their widespread interest in science. Not only are most of them interested but substantial numbers plan careers involving scientific preparation . . .

- 55 per cent of the boys who took the 1956 general scholarship examination of the National Honor Society said that they planned to take college majors in science or engineering.
- 56 per cent of the boys and 16 per cent of the girls among the semifinalists in the 1956 National Merit Scholarship Examination said that they planned careers in science.
- In recent years there has been a marked increase in the number of students participating in science contests, talent searches, and programs of awards for achievement in science.
- An amazing increase has occurred in the number of school science fairs, exhibitions, and science congresses, many of them associated with Junior Academies of Science.
- A survey made recently by the University of Illinois staff reported that "children ask more questions about science than any other subject." Science questions predominated two to one.

NO ONE REALLY KNOWS the full extent of the interest of youth in various aspects of science. Unfortunately for many youth—they lack guidance—they lack laboratories and workshops—they lack encouragement from parents and other adults to take advantage of available opportunities—their schools have not offered them science clubs—school programs have not been organized to give special opportunities to those with unusual inclinations toward science.

THERE ARE SOME ENCOURAGING SIGNS

- increased concern for science in elementary schools
- increasing enrollment in high schools
- widespread interest in science among youth and adults
- large enrollments in science courses
- many able and devoted teachers
- large numbers of summer institutes for science teachers and large numbers of applicants

. . . BUT THERE ARE IMPEDIMENTS TO PROGRESS, TOO

- too few qualified science teachers
- lack of incentives to inspire teachers
- too heavy teaching load on teachers
- inadequate materials, facilities, and laboratories
- too little time for science teachers for planning, caring for laboratories and facilities, taking field trips

ALL CITIZENS, ESPECIALLY SCHOOL BOARD MEMBERS, SHOULD TAKE BOLD ACTION TO INCREASE THE ENCOURAGING SIGNS AND TO ELIMINATE THE IMPEDIMENTS

America Has the Resources . . .

We have the people, widespread interest in science, an exceptional group of young students, the know-how in science, and a well-developed system of schools and colleges. If we really want to do so, we can build up the supply of qualified teachers and overcome the other impediments.

BUT CERTAIN QUESTIONS NEED TO BE ANSWERED, such as

When we consider that nearly all senior high school students have had courses in junior high school GENERAL SCIENCE,

- Why do many youngsters, fascinated by science at elementary school and junior high levels, avoid science in senior high school?
- Why, in senior high school, do 27 per cent fail to take high school BIOLOGY; 68 per cent avoid CHEMISTRY; and 77 per cent by-pass PHYSICS?
- Why do 50 per cent of the high school graduates of superior ability fail to go to college?
- Why do many high school graduates with special scientific interests reveal little or no interest in college science courses?
- Why do many students who begin a science or engineering program in college transfer to other fields?
- Why do so many who prepare to teach high school science fail to become teachers after graduation?
- Why do many young and competent science teachers in high schools leave teaching for other types of employment?
- What factors combine to make some science teachers more effective than others?

THERE ARE NO PAT, EASY ANSWERS to most of the foregoing questions. Some high school students are afraid to take science courses because of deficiencies in their mathematics. Some have the false notion that only a "genius" can succeed in science. Many science classes are dull "textbook, chalk, and talk" rather than real, lifelike experiences. Curricula and courses of study often need modernization. In some schools, laboratories may not be used effectively; in many others, they are not well designed or properly equipped. Attention to the improvement of teaching and career counseling is needed at college levels, too.

COOPERATION AMONG EDUCATORS AND OTHER CITIZENS TO GET BETTER INSTRUCTIONAL MATERIALS, METHODS OF TEACHING, AND COUNSELING FOR SCIENCE PROGRAMS IN SCHOOLS AND COLLEGES

TARGET No. 4

The National Science Teachers Association Proposes . . .

FOR HIGH SCHOOL STUDENTS

- the development of more effective curriculum designs and more effective methods of teaching science
- the provision of learning materials designed to supplement the textbooks
- the organization of more and better school science fairs, science congresses, and exhibits where youth may show the results of their own efforts and may learn and gain stimulation from the work of others
- the offering of more scholarships, awards, and recognition for students who show special capacity or outstanding achievement in scientific and other intellectual efforts
- the improvement of guidance facilities and of materials to explain the needs, kinds of work, and the rewards and satisfactions in careers in fields of science, engineering, and technology
- the improvement in techniques for identifying the more able students and in provisions for teaching superior students in science

FOR THE RECRUITMENT OF MORE SCIENCE TEACHERS

- the development of community studies that will demonstrate the importance of the school science *program* and emphasize the vital role of the *science teachers*
- the wider use of guidance materials for high school and college students to show them the opportunities and satisfactions in science teaching
- the revision of teacher education programs to make them more functional and more attractive to those who wish to become teachers
- the revision of certification requirements and professional standards, as necessary, to improve the quality of science teaching
- the offering of more scholarships and fellowships for qualified students who wish to become teachers but who are unable to afford a college education

FOR EXPERIENCED TEACHERS NOW IN SERVICE

- the development of an intense nation-wide effort to increase the salaries of all teachers, with consideration of ways to reward effective teaching on the basis of demonstrated merit
- the organization of more work-study conferences and the support of more research-type studies relating to curricula and instruction in science
- increased opportunities for science teachers to have brief summer employment in science-related industries and as research assistants in colleges and universities
- the offering of awards and scholarships to enable science teachers to take additional preparation
- the provision of financial grants to enable qualified teachers to carry out "on the job" research projects
- the provision of opportunity, time, and money for teachers to improve the science curriculum, to improve instructional materials, and to plan facilities for use in teaching

Progress Is Being Made . . .

THE NATIONAL SCIENCE TEACHERS ASSOCIATION IS NOW

- Reaching 20,000 teachers regularly with its program of services and publications—*The Science Teacher* and the *Elementary School Science Bulletin.*
- Affording contacts and working relations with other groups of classroom teachers and school administrators through its status as a department of the National Education Association.
- Maintaining and re-creating an action program to stimulate the interest of youth in science. The Future Scientists of America Foundation reaches 35,000 high school science teachers, who instruct some 4,000,000 students. A large number of forward-looking industries have made generous financial grants to the FSA Foundation to make the programs and services possible.
- Providing awards to recognize the science achievements of high school students. Funds, up to the present, have been made available by the American Society for Metals.
- Holding special work-study summer conferences of science teachers. Financial support for these has been provided by the Crown Zellerbach Foundation, Marathon Corporation, West Virginia Pulp and Paper Company, and Scott Paper Company.
- Making awards to some outstanding science teachers. Some funds for this purpose were granted to NSTA by the U. S. National Cancer Institute.
- Providing career information and guidance materials, such as *Keys to Careers* and *Careers in Science Teaching,* to help young people choose careers wisely and to help teachers in counseling students.
- Planning curriculum studies and the development of reports to teachers through the NSTA Commission on Education in the Basic Sciences.
- Working closely with many societies, groups, and agencies in the coordination of planning and effort, in the evaluation of proposals, and in reaching teachers with action results.

FEATURED EFFORTS OF SOME OTHER NATION-WIDE PROGRAMS are as follows:

- AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE—through its Science Teaching Improvement Program is experimenting with science counselors in a number of states; is bringing mathematics, science, and education departments "closer together" in the preparation of teachers; is conducting studies and disseminating information; is experimenting with traveling libraries for high schools. NSTA is an affiliate of AAAS.
- SCIENCE CLUBS OF AMERICA—provides materials and encouragement for science clubs and science fairs; conducts the National Science Fair; conducts the Westinghouse Science Talent Search.
- NATIONAL SCIENCE FOUNDATION—provides federal funds for summer and academic-year institutes for science teachers; underwrites through grants many research-type studies and programs; provides staff and other services to the President's National Committee for the Development of Scientists and Engineers.
- INDUSTRIAL SUPPORT — by several companies, trade associations, and similar groups has made possible: scholarships for science teachers and students; business-sponsored teaching aids for science; numerous special projects carried out through grants-in-aid to other groups.

THE NATIONAL SCIENCE TEACHERS ASSOCIATION

- recognizes that significant gains are being made in support of the strengthening of science teaching. BUT—NSTA also believes that MUCH MORE NEEDS TO BE DONE AND CAN BE DONE.

Write to

NATIONAL SCIENCE TEACHERS ASSOCIATION

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The Summer Camp and Childhood Education

By LOUIS RZEPKA

The author is now studying for his doctorate at Columbia University, New York City, on leave from the Detroit, Michigan, Public Schools. He formerly was a teacher at the Merrill Palmer School in Detroit.

TODAY camping for children of elementary school age is a common experience for many boys and girls. Each summer there is a mass exodus of school children from the city to the country. Besides their summer camp experiences, some children are also provided with school camp activities. There can be no doubt of the intrinsic worth of a meaningful camping experience provided by a rural setting and a professional staff primarily interested in the growth and development of children.

One could enumerate any number of positive outcomes of a successful camp experience. Here, however, the purpose is to be specific in presenting one dimension of childhood education in which both school and camp activities can become a related series of experiences, having meaning and significance as part of the child's continuous education. Taking cues from both the child and his environment, we find that elementary science education, formerly called "nature study," has a tremendous potential for integrating camp and school experiences of children.

Both the camping movement and elementary science education have a common orientation—that is, the interpretation of the child's environment. The summer or school camp, because of its location, has an ideal opportunity to provide many new and meaningful experiences in the realm of biological and physical phenomena through its science program. Children living in urban industrial centers have limited opportunities to become acquainted with the world of living things. Being suddenly transported out of an environment of asphalt and cement, to what is sometimes considered by the child a veritable wilderness of wildlife, the child finds the natural environment of the camp an entirely new world—a world in need of sympathetic interpretation based upon his needs and purposes. Thus science education, as one of the foundations of the camp program, will be seen to have two interdependent and interrelated functions. First, it should serve to interpret the new natural world in which the child finds himself; second, it should be the means for utilizing the past school experiences of children.

Making a study of the lake, the summer camp replacement for the schoolroom aquarium.

In their school experiences, most children have opportunities to find out about such scientific phenomena as the habits of common animals, the names and structure of plants, some geology, and an insight into astronomy. School experiences such as these are valuable. However, they only give the child a beginning of an understanding of the relationships of plants, animals, lakes, forests, and swamps to each other and ultimately to himself. The science program of the summer camp should be the unifying agent by which these past school experiences of children can be made more meaningful and, at the same time, useful to the child in acquiring an "at home feeling" in the camp surroundings.

If the science program is to fulfill its function of helping children to understand their world, it cannot be a fact-centered program through which children learn the names of 20 birds or ten trees. It has to be centered around purposeful activities. Boys and girls of elementary school age want to be active, they want to do things, to share in group activities, and to participate in real undertakings. Children learn best when they are engaged in activities centered around their interests and purposes. The central theme of a science program which is aimed at promoting insight and under-

standing of the environment will therefore be a program organized around learning activities.

At the Merrill Palmer camp (of the Merrill Palmer School, Detroit, Michigan), the science program was organized around four major areas. These were: (1) activities carried on within the science cabin; (2) those activities carried on outside the science cabin; (3) field trips on the camp grounds; and (4) field trips away from camp.

The science cabin, or the "zoo" as the children called it, was a laboratory, museum, and workshop all combined into one. It was a laboratory where boys and girls found opportunities to talk about their everyday experiences, to observe phenomena such as the working of bees in the observation hive, to carry on experimentation such as feeding the king snake to observe its constricting powers, and to arrive at conclusions resulting from their activities. The science cabin was a workshop in that it provided opportunities for boys and girls to make things. Construction projects such as animal cages, insect collections, mineral boxes, leaf prints, plaster fish plaques, bulletin boards, and science scrapbooks, were continuously in evidence. The science cabin was a museum in that it had a variety of exhibits, specimens, and collections of a scientific nature. However, this museum was not a dead museum where children just came to look; rather, it was alive in the true sense of the word. It was here that children had their collections, their exhibits, and the animals which they captured and provided a home for. This was a museum in which children did not spend their time in passive inactivity, but rather a place where they could touch, feel, and handle the materials presented.

Although the interior of the science cabin was a continual beehive of activity, there were a number of activities being pursued within its immediate vicinity. Such construction projects as a pen for two pet rabbits, a chicken coop for a sitting hen, and an outdoor fish pool were examples of these activities. Handling the pet king snake and the rabbits were popular pastimes with the younger campers. The camp newspaper always had reporters assigned to the zoo to gather information about new additions to the zoo menagerie, exciting comments about the latest field trip, or some glimpse of coming events.

Releasing the weather balloon.

The third area of the science program was the field trip taken on the camp grounds. The camp environment consisted of approximately 140 acres of woodlands, swamps, meadows, and a lake. The

Visiting the bee farm.

field trip had three specific purposes: (1) to collect biological specimens; (2) to familiarize the children with the camp grounds; and (3) to obtain specific information pertaining to some particular study a child might be undertaking, such as the location of a certain animal's habitat. The actual experience of observing a frog in its natural habitat, capturing it, making a home for it, providing for its basic needs, and then releasing it was a true learning experience partly provided for by the field trip.

When a child first arrives at camp, it is interesting to watch him explore every nook and cranny within the immediate vicinity of his cabin. As his curiosity is satisfied, he will begin to ask questions about the other areas of the camp. This natural curiosity of children can be amply satisfied by the second purpose of the field trip, namely, to give the campers new understandings of what lies over the next hill, where the swamps are, to whom the neighboring farms belong, where the various roads lead to, and so on. In some children who have a fear of the unknown, especially some of the younger campers to whom the camp is a world all in itself, the field trip through its exploratory activities can help instill a sense of security. As

the child becomes acquainted with the camp setting, the need for adult security will be lessened or may entirely vanish. The child can then take part in self-directed exploratory activities to further satisfy his curiosity.

The third purpose of the field trip was to secure specific information. Examples of such information would be to take a bird census of the camp or a biological survey to determine the particular species of animal life living in the area. At times a child would be interested in a particular animal or plant about which he did not have very much information. The zoo library was first consulted to get the general information needed to pursue the study further. The next step was to plan a field trip to acquire firsthand information about the topic being studied.

Almost every camp has within its environs places of interest to children. These may be a dairy farm, apiary, or a state park. There are many opportunities for learning experiences through the use of field trips to places away from camp. As an example, a trip to a gravel pit can serve a variety of purposes. These may be to provide new insights into the geological history of the camp site, its relationship to the people living near it, or the ultimate use of its products. A trip to a nearby farm or an apiary can be of immeasurable value. Having the opportunity to milk a cow, or to observe the processing of honey in its various stages from the comb to the finished product, will linger in the child's memory long after the camp season comes to a close. Field trips planned and carried out with a definite purpose can play an important part in the ultimate success of the science program.

A word or two should be said about the use of "resource persons" as a part of the program. If the camp is located near a community, there is usually someone who has a special interest in science and who would be willing to share this interest with the campers. Such possibilities should be capitalized on to further enrich the program. An example of such a resource person at Merrill Palmer was a well-known wildlife illustrator who was invited to visit the camp. He not only came to talk to the campers about his work but he also showed many of his paintings which have been published in national magazines and textbooks dealing with mammal and bird life. The children had the opportunity not only to see a practical application of an interest in science but were also able to appreciate more fully the various activities they were engaged in.

These are just a few ideas on how school learning in the life sciences can be carried over into a camp situation for the express purpose of developing and extending biological concepts with elementary school children. However, we are still a long way from a philosophy of elementary education which would consider both the school and camp experiences of children as continuous and on-going, and to utilize them in such manner as to provide optimum learning situations for children. To this end we have succeeded to some degree in past science programs at Merrill Palmer.

Hunting for fossils at the gravel pit.

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FREDERICK R. AVIS, chairman, science department, Saint Mark's School, Southborough, Mass. *Aspects of the Development of Precollegiate Science Summer Schools.* Formerly head of biology and science departments in Massachusetts schools. Author, "About Mice and Man" and various articles. Science teacher 22 yrs.

VIVLA V. JOHNSON, general science teacher, Norman Jr. H. S., Norman, Oklahoma. *Instructional Unit on Cancer Classroom Tested for Ninth Grade Level Students.* Member of Phi Sigma, Sigma Xi, Kappa Delta Phi. Former secretary, science section, Oklahoma Education Association. Science teacher 20 yrs.

ROBERT B. LEITCH, science teacher, audio-visual co-ordinator, Lincoln Jr. H. S., Santa Monica, Calif. *The Creation and Evaluation of a Project to Overcome Science Handicaps.* Brochure committee, DAVI; previously won three NSTA awards. Author of numerous articles in professional journals. Science teacher 33 yrs.

GEORGE E. MAGNUSSON, instructor in general and life sciences, Mira Costa H. S., Manhattan Beach, Calif. *Dixie Cup Science.* Member of Delta Phi and Beta-Beta-Beta. Explorer Scout Post Advisor. Formerly missionary in Tahiti for the Church of Jesus Christ of Latter-Day Saints, 1946-48. Science teacher 4 yrs.

DUILIO A. PALMIERI, science teacher, Liverpool Central (H. S.) Schools, Liverpool, N. Y. *An Experiment in Nutrition for High School Biology Students.* Member of Kappa Phi Kappa, Psi Chi. Awarded fellowship to Syracuse University chemistry institute under auspices of NSF (1955). Science teacher 9 yrs.

IT ALL BEGAN in a ground floor parlor in the old Hotel Martinque in Washington on January 7, 1956. Thirteen of us—including college and university teachers of medicine, biology, and education; a secondary school science supervisor and specialist; a medical administrator; research scientists; and publicists—faced the problem of producing a set of ground rules for a new program of teacher recognition.

Our very benevolent sponsors, the representatives of the U. S. National Cancer Institute, could have insisted that entries be limited to those dealing with cancer. However, these wise, patient, far-seeing, and dedicated men saw that their purposes would be far better served with less rigid entrance provisions.

The purposes of the newly-christened Science Teacher Achievement Recognition (STAR) awards program, administered by the National Science Teachers Association under a grant from the National Cancer Institute, were set down as follows:

> The National Cancer Institute appreciates the importance of the science teacher in developing a pool of young scientists from which may be recruited future leaders in research, science teaching, and other scientific professions.
>
> This program is therefore designed to stimulate and to recognize superior science instruction in grades 7 through 12 in public, private, and parochial schools. STAR is planned to encourage the development of creative ideas, teaching materials, and teaching techniques and to secure the widest possible dissemination of such, for the following purposes:
>
> a. Raising the general level of science instruction.
> b. Influencing more young people to enter the fields of science and science teaching.
> c. Helping young people to understand that the key to our science problems is more and better basic research.
> d. Developing the understanding that many important science problems (such as the control of cancer) require the cooperative attack of specialists in fields as diverse as physics, botany, chemistry, physiology, genetics, and bacteriology.
> e. Developing a thorough understanding of the basic principles of biological and physical science and their application to such fields

AWARDS

as health through presently established courses.

f. Developing more reflective and critical habits of thought.

g. Helping young people to gain skill in scientific problem solving.

How successful was the STAR program? There are several ways to judge.

Let us first consider the extent of participation. Similar programs were conducted by the National Science Teachers Association in previous years. In 1952, there were 57 entries; in 1953, 47 entries; and in 1954, 130 entries. In the STAR program, more than 300 entries were submitted.

All who participated officially in the judging agreed that the caliber of the entries was very high. The judges found it difficult to select, from the 306 entries submitted, the best 50 entries for a so-called winner's pool. We finally chose 58. Of these, ten were selected as cash award winners and the remaining 48 (plus two co-entrants) were designated medallion winners.

Representatives of the National Cancer Institute, including its director, Dr. John R. Heller, who read the winning entries after the judgments had been made, were much impressed by their fine quality.

A striking feature of the entries was their variety. Entries on apparatus from teachers of physical science ranged from one that described some 40 ways of using Dixie cups in demonstration teaching to a device for demonstrating the laws of uniformly accelerated motion that is a masterpiece of equipment construction. In biology, the use of unusual laboratory animals is perhaps best illustrated by two projects. In the first, a boa constrictor was used to measure the uptake of radioactive iodine; in the second, a class reconstructed a skeleton of a horse. In the field of ecology, one teacher submitted a report on a classroom which, at the moment of writing, housed several species each of rats, rabbits, and guinea pigs; some squirrels; several kinds of snakes and salamanders; a woodchuck, and 70 kinds of house plants (and, we assume, a classroom full of enthusiastic pupils). In the same field, another teacher submitted a report on an expedition made into Yellowstone Park by several of his pupils and himself. Unusual extracurricular projects that

CARL H. PFEIFFER, chemistry and physics teacher, Merrill Sr. H. S., Merrill, Wis. *A Physics Class Camping Trip.* General Electric fellowship at Case Institute of Technology, 1955; recipient of U. S. Junior Chamber of Commerce distinguished service award, Merrill, Wis., 1955. Science teacher 6 yrs.

HARVEY POLLACK, physics teacher, Forest Hills H. S., Forest Hills, N. Y. *An Apparatus for Demonstrating the Laws of Uniformly Accelerated Motion.* Author of numerous articles and books published by the New York Technical Institute, and other publishers, on electronics and related subjects. Science teacher 10 yrs.

RICHARD SALINGER, biology and general science teacher, head, science dept., Wilton Jr.-Sr. H. S., Wilton, Conn. *A One-Day Science Teacher Institute.* Grantee, Hayden Nature Training Course, Boston Museum of Science; NSF, Wesleyan University, Middletown, Conn. Publicity chairman, CSTA. Science teacher 5 yrs.

JOHN E. SMITH, chemistry instructor, Nyack Jr.-Sr. H. S., Nyack, N. Y. *Research and Techniques Designed to Raise the General Level of Science Instruction.* Author of articles in professional journals and Iowa State College publications, including "Teaching to Learn." Science teacher 4 yrs.

RUBY E. WHEELER, biology teacher, Stratford H. S., Stratford, Conn. *Living Biology.* Taught in Connecticut ungraded, primary, and intermediate grades. Biology teacher since 1941 "with very little background" (to begin with); took courses at University of Bridgeport "to cover certification." Science teacher 21 yrs.

were awarded prizes included reports on a camping trip by a physics class to a hydroelectric generating plant; another on a precollegiate science summer school; and a third on a one-day science teacher institute conceived and executed by a single teacher.

The National Committee of STAR was extremely proud to announce the program winners at the 5th National Convention of the National Science Teachers Association at Cleveland, Ohio, on the evening of March 21, 1957. Each cash award winner received a check for $200.00; each medallion winner, an inscribed medallion. Each school represented by a winning entry will receive an inscribed plaque.

A brochure containing a selection of winning STAR entries will be published and distributed this fall.

In the listings of the winners, the title of the project is in italics. Brief biographical data is given. The figure at the end of each listing is the number of years the winner has been a science teacher.

THE MEDALLION WINNERS

Louis B. Alcorta, chairman, science dept., Galileo H. S., San Francisco, Calif., currently on leave for study at Stanford University. *How Warm Are My Molecules?* (with Eugene Roberts). 5.

Patricia Archibald, general science teacher, Crown Point Jr.-Sr. H. S., Crown Point, Indiana. *Major Disease Threats.* 3.

John A. Banasick, general science and biology teacher, East Huntingdon Township H. S., Alverton, Pa. *A Unit in Reproduction.* 2.

Joel Beller, biology and general science teacher, Richmond Hill H. S., Richmond Hill, N. Y. *An Experiment to Determine the Uptake of Iodine 131 by a Test Animal.* 4.

Stanley R. Breckner, general science instructor, Albert Lea Jr. H. S., Albert Lea, Minn. *Semi Micro-Macro Technics for Teaching General Science.* 12.

Doris Brenneman, biology teacher, Richmond Union H. S., Richmond, Calif. *Biology for Interest and Social Usefulness.* 24.

Eldon C. Couey, chemistry teacher, Vallejo Sr. H. S., Vallejo, Calif. *Cigarettes and Cancer.* 23.

David M. Dennis, science and mathematics teacher, Monroe Jr. H. S., Albuquerque, N. Mex. *Organizing a Rocket Club as a Means for Developing Gifted Students.* 5.

Ralph R. Domino, science and mathematics teacher, Julian Curtiss School, Greenwich, Conn. *A Correlated Unit in Biology.* 2.

Rocco V. Feravolo, principal, George Washington School, Morristown, N. J. *The Teaching of Elementary Astronautics to the Gifted Child in Science.* 4.

Robert K. Fitzgerel, chemistry instructor, Van Horn H. S., Kansas City, Mo. *Demonstration Experiments for High School Chemistry.* 5.

Ray Forrest, physics teacher, Millburn H. S., Millburn, N. J. *Teaching Television by the Demonstration Method.* 1½.

Robert L. Gantert, science teacher, Alexander Hamilton Jr. H. S., Seattle Wash. *Extracurricular Dental Project* (with Dale S. Hunter). 9.

William S. Green, biology teacher, North H. S., Denver, Colo. *Study Plan Designed to Stimulate and Challenge Biology Students in the Field of Critical Thinking.* 30.

Wallace J. Hennessy, biology instructor, Castro Valley H. S., Castro Valley, Calif. *A Report on the Yellowstone Science Expedition.* 7.

Robert K. Henrich, chemistry teacher, head, science dept., Columbia H. S., Richland, Wash. *Improving Science Interest and Instruction.* 17.

Mercedes Hernandez, biology and chemistry teacher, dept. head, Brandon H. S., Brandon, Fla. *Dynamic Demonstration Model of the Human Circulatory System.* 6.

Dale S. Hunter, science and mathematics teacher, chairman, dept., Alexander Hamilton Jr. H. S., Seattle, Wash. *Extracurricular Dental Project* (with Robert Gantert). 2.

L. Chester Irons, teacher, Perry H. S., Pittsburgh, Pa. *A Working Biology Club.* 32.

Paul Kahn, biology teacher, Bronx H. S. of Science, New York City. *Almost All Science Students Can Be Creative.* 16.

Phoebe H. Knipling, helping teacher in secondary science, Arlington County Schools, Arlington, Va. *Using Community Resources to Enrich Science Education in Secondary Schools.* 17.

Charles A. Koepke III, science teacher, John Marshall Jr. H. S., Stockton, Calif. *The Flight of Men.* 4.

Milton S. Lesser, chairman, biology dept., Thomas Jefferson H. S., Brooklyn, N. Y. *Teaching the Use of Scientific Methods Through a Study of Yeast.* 22½.

Louis T. Masson, assistant principal, Kensington H. S., Buffalo, N. Y. *A Research Technique for Developing Scientific Thinking through the Creation of Demonstration Devices in Science.* 38.

Clifford R. Nelson, junior high school science consultant, Weeks Jr. H. S., Newton Centre, Mass. *ABOUT ME—A Science Unit for Ninth Grade Boys and Girls.* 22.

Carl J. Olson, principal, 6th grade teacher, Yorkville Grade School, Yorkville, Ill. *Reconstruction of a Horse Skeleton by Seventh and Eighth Grade Students.* 1.

Thomas G. Overmire, biology teacher, Shortridge H. S., Indianapolis, Ind. *An Exercise Designed to Develop Critical Thinking in Ecology.* 5.

Charles W. Owens, Jr., chemistry instructor, N. R. Crozier Technical H. S., Dallas, Texas. *Paint Short Course for High School Chemistry Students.* 7.

John O. Parker, science and mathematics teacher, North Thurston H. S., Lacey, Wash. *The Slide Rule—A Combined Theoretical and Practical Approach.* 5.

Steven M. Pattee, biology teacher, Roosevelt H. S., Cedar Rapids, Iowa. *Learning to Live with Radiation—A Problem in Biology.* 29.

Harold P. Pluimer, principal, science teacher, Renville H. S., Renville, Minn. *Resource Units.* 7.

Eugene Roberts, head, science dept., Polytechnic H. S., San Francisco, Calif. *How Warm Are My Molecules?* (with Louis Alcorta). 11.

Francis J. St. Lawrence, chairman, science dept., Lindbergh Jr. H. S., Long Beach, Calif. *Science Projects for Superior Students.* 12.

David W. Saltus, physics instructor, Wakefield H. S., Arlington, Va. *A Unit on the Research Team for High School Physics.* 9.

Louise A. Schwabe, science teacher, Kenmore Sr. H. S., Kenmore, N. Y. *Pupil Projects in the Field of General Biology.* 25.

Sidney Seltzer, general science teacher, Simon Baruch Jr. H. S. 104, New York City. *A Study of the Skin and Its Care as an Incentive to Learning Activities.* 1½.

Arlena E. Seneca, biology instructor, head, science dept., South Mountain H. S., Phoenix, Ariz. *Whack That Quack.* 14.

Robert Silber, chemistry instructor, head, science dept., Central H. S., Evansville, Ind. *Basic Research on the High School Level Using Students as Assistants.* 5.

Sister Mary Casimir, head, science dept., Camden Catholic H. S., Camden, N. J. *Radioisotopes, Their Nature and Production—And Some Experimental Work that May Be Done with Them by Students of High School Chemistry.* 21.

David T. Smith, physics teacher, Catalina H. S., Tucson, Ariz. *Series of Mobiles Developed to Illustrate the Usual Units of the General Science Course.* 12.

William M. Smith, biology teacher, director, visual education, Thomas Carr Howe H. S., Indianapolis, Ind. *Successive Osmosis.* 18.

Charles W. Stonebarger, science teacher, Brooklyn Friends School, Brooklyn, N. Y. *Tailor-Made for Discovery—A New Approach to Laboratory Exercises in High School Physics.* 4.

Robert H. Strahlendorf, teacher, Mastbaum Vocational Technical School, Philadelphia, Pa. *The Activity of Germinating Pollen and Its Use in the Biology Classroom.* 4.

Olive W. Sudler, biology teacher, Milford Mill H. S., Baltimore, Md. *A Project to Interest Biology Students in the Work of the Technologist.* 17.

Richard F. Thaw, biology instructor, chairman, science dept., Corvallis H. S., Corvallis, Ore. *Laboratory Biology.* 11.

Richard Trump, biology instructor, Ames H. S., Ames, Iowa. *Log of a Biology Teacher.* 20.

William O. Tuominen, biology teacher, Harrison Technical H. S., Chicago, Ill. *Biology Lesson Plan and its Foundations.* 7.

Oscar D. Washington, chairman, science dept., Vashon H. S., St. Louis, Mo. *A Citizen Education Project.* 20.

Stanley L. Weinberg, biology teacher, Bronx H. S. of Science, New York City. *Outline of a Sequence of Lessons in Basic Photography for a General Science Course.* 17.

Charles J. Wright, biology teacher, Miami Jackson H. S., Miami, Fla. *An Exercise Covering the Research Method of Solving Problems.* 15.

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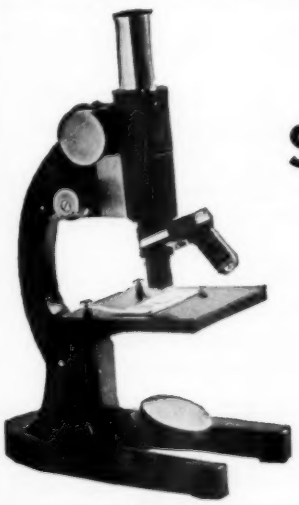

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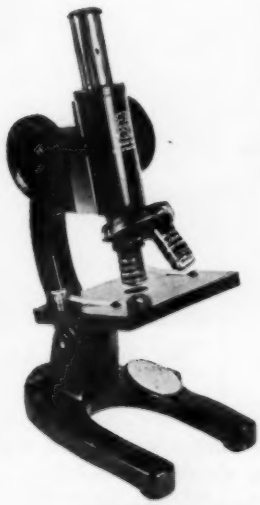

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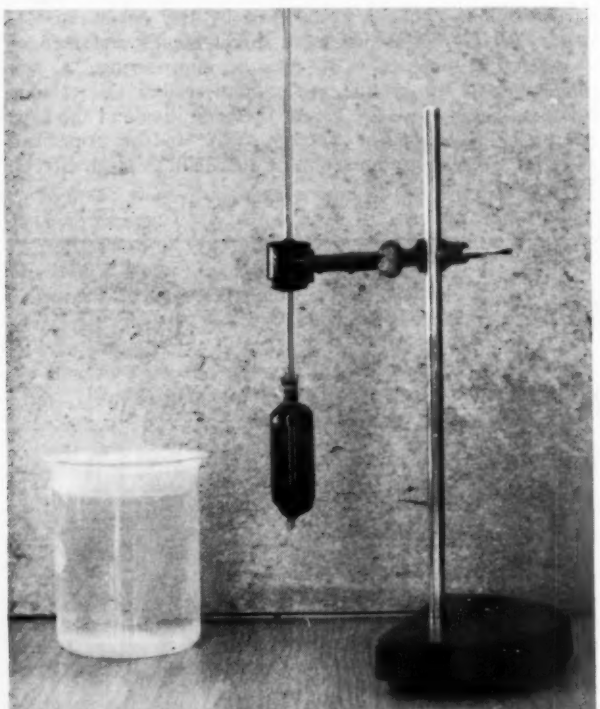
Classroom Ideas

Biology

A Simple Demonstration of Osmosis

By WILLIAM KASTRINOS, Biology Department, Glenbard High School, Glen Ellyn, Illinois

The preparation of a demonstration of osmosis can be done easily by the student or teacher with a transparent cellulose tubing. This material is manufactured by makers of cellulose sausage casing.



The author's photograph of his apparatus.

The tubing is permeable to water and will allow low molecular weight compounds in aqueous solution to diffuse while refusing passage to higher molecular weight materials, such as proteins. This material can be obtained inexpensively in 100-foot rolls of various diameter and is easily stored. The student can set up and participate in the osmosis demonstration instead of watching the instructor.

Directions

1. Immerse tubing in water (two to four minutes).
2. Fold bottom of membrane and tie.
3. Put in osmotic fluid.
4. Tie to glass tube.

General Science

A Resistance Wire Glass Cutter

By ALBERT PILTZ, Consultant in Elementary Education and Science, Los Angeles, California, County Schools

A simple device for cutting the tops of glass jugs, bottles, or jars may be easily constructed and have a multiple of uses in the classroom.

Children and teachers frequently have a need for jars with wide surface areas. Such jars may be obtained by cutting the tops of gallon jugs, i.e., pickle and mayonnaise jars. These jars, when cut properly, make excellent terraria and aquaria for housing fish, amphibians, reptiles, insects, and small mammals. They may also be used for plant habitats such as desert, woodland, bog, swamp, and aquatic.

The top portion of the glass jar (see Figure 3) makes a good protective cover for seedlings as well as soil drainage demonstration containers.

A gallon jug may be converted to a bell jar by

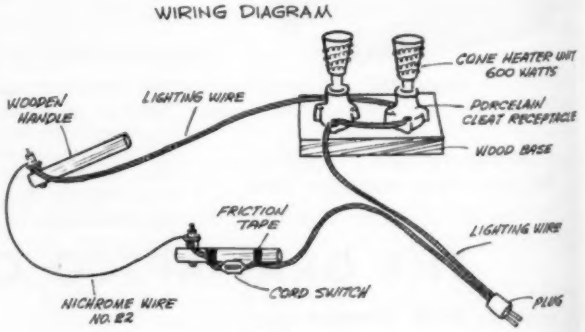


FIG. 1

removing the bottom of the jug. The bell jar may be used in respiration experiments and for vacuum type demonstrations.

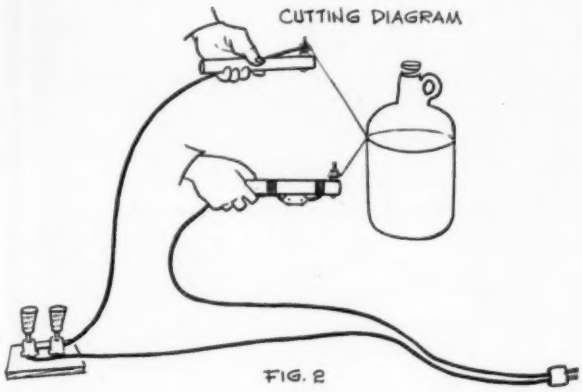


FIG. 2

Gallon jugs or jars may be procured gratis from cafeterias and confectionery stores.

Materials for constructing a resistance wire glass cutter

1 board (2″ x 4″ x 10″)
2 porcelain cleat receptacles
2 cone heater units (600 watts each)
15 feet of lighting wire
3 feet of nichrome wire #22
2 wooden handles (6″ - 9″)
1 cord switch
2 bolts or screws
4 nuts
4 washers
2 strips friction tape

FIG. 3

Directions for constructing a wire glass cutter

The materials for the wire cutter are assembled as illustrated in Figure 1. The two porcelain cleat receptacles are mounted on a board (2″ x 4″ x 10″) and two 600-watt heat units inserted. Three feet of nichrome wire #22 is firmly attached between two washers which are held in place by two bolts and nuts and fastened between two wooden handles. Holes are bored at the ends of the handles to support the nut, bolt, and washer assembly. The connection between the nichrome wire and lighting wire is made beneath the washers and nuts. A cord switch or push canopy switch taped to one of the wooden handles helps control the current. The circuit is wired as indicated in Figure 1.

Cutting the jar

The method for cutting a jar is illustrated in Figure 2. In using the cutter, first file a small groove on the glass jar where the nichrome wire will cross. Adjust the nichrome wire in a loop around the jar in the desired position for cutting. Hold the wire close, in place, but keep the wires from touching where they meet at the small groove. Make sure that the cord is plugged into the outlet, then use the cord switch. The wire will become hot and glow like toaster wire. After a few seconds, the jar will crack in a clean cut where the wire has looped the jar. The cutter will work from any standard house outlet (110-115 V).

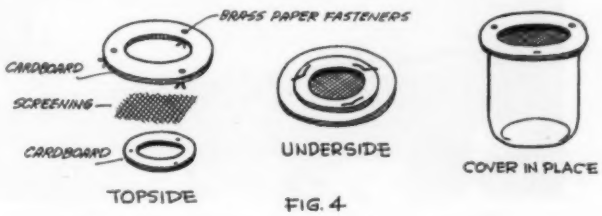


FIG. 4

Finishing the cut jar

In order to dull the sharp edge left by the cutting of the jar, a pumice or carborundum stone is rubbed with slight pressure along the edge until it is smooth. Adhesive, mystic, or scotch tapes fastened over the sharp edge is another way of protecting the hands from possible cuts.

Two pieces of cardboard, cut as illustrated in Figure 4, and sandwiching a piece of copper screening makes an excellent cover for a gallon jug. The rings of cardboard and screening are held together by brass paper fasteners.

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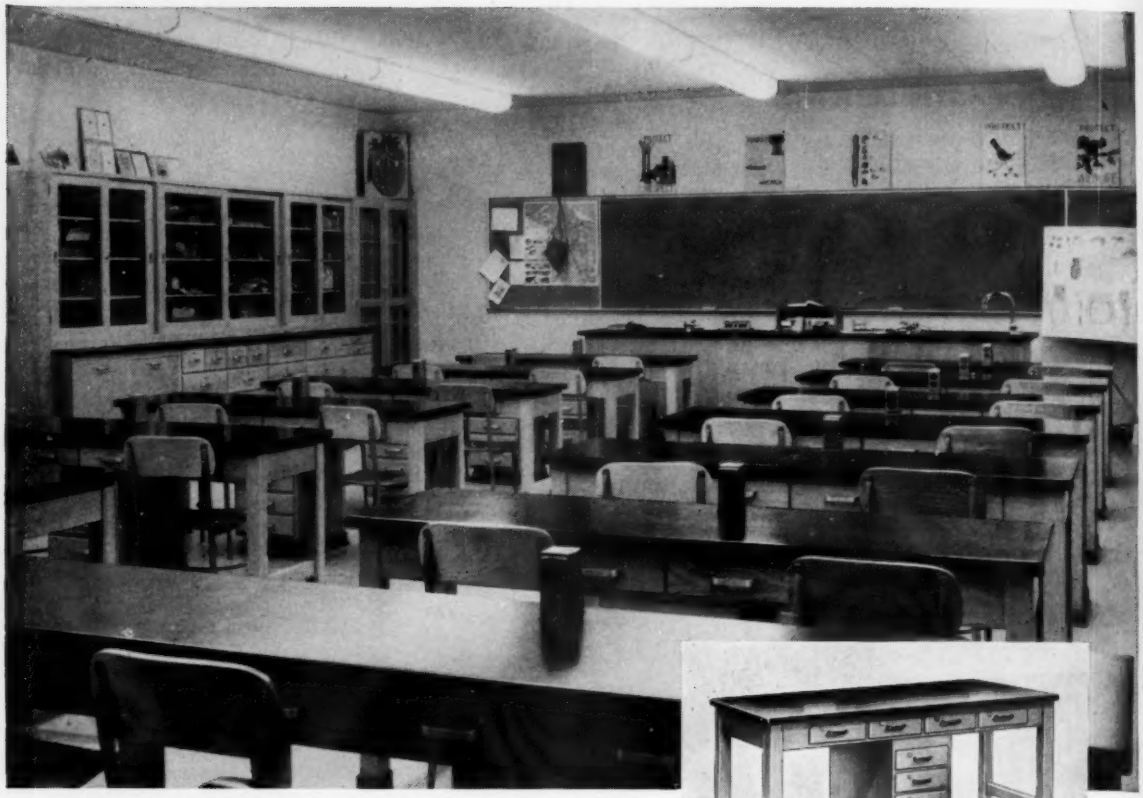

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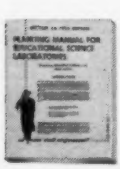

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REPRESENTATIVES IN PRINCIPAL CITIES

NSTA Officers and Directors for 1957-58

A record number of more than 1800 ballots were cast in the NSTA 1957 elections which selected 11 new officers and directors for the 1957-58 NSTA Board of Directors. Including ten officials who are holdovers from previous elections, the new administration will take office July 1, 1957. Madeleine T. Skirven, of Eastern High School, Baltimore, Maryland, served as Chairman of this year's Elections Committee.

The incoming Board of Directors is listed below (asterisks appear before the names of those officials selected in the 1957 elections).

John S. Richardson, left, Retiring President 1957-58, Professor of Education, The Ohio State University, Columbus. Formerly NSTA Treasurer; co-author of *Methods and Materials for Teaching General and Physical Science* (McGraw-Hill); author of numerous articles on science education.

Herbert A. Smith, right, President-elect 1957-58. Professor of Education and Director, Bureau of Educational Research and Service, University of Kansas, Lawrence. Currently NSTA Region VII Director; formerly science teacher, Nebraska high schools; author of many articles in science journals.

Glenn O. Blough, above, President 1957-58, Assoicate Professor of Education, University of Maryland, College Park. Formerly Specialist for Elementary Science, U. S. Office of Education, Washington, D. C.; Instructor, University of Chicago. Formerly NSTA Director-at-Large, Chairman, NSTA Elementary Science Committee and Editor, *Elementary School Science Bulletin.* Author and co-author of more than two dozen books including "Elementary School Science and How to Teach It." Honorary doctor of laws for outstanding work in education.

H. M. Louderback, left, Secretary 1957-58, Chemistry Teacher, Lewis and Clark High School, Spokane, Washington. Formerly NSTA Region VIII Director; science teacher for 25 years in Washington and Idaho high schools.

Robert T. Lagemann, right, Treasurer 1957-58, Chairman, Department of Physics and Astronomy, Vanderbilt University, Nashville, Tennessee. Currently NSTA Region III Director; formerly Professor, Emory University; Physicist, Manhattan District, World War II.

BOARD OF DIRECTORS

Executive Committee

President: Glenn O. Blough
***President-elect:** Herbert A. Smith
Retiring President: John S. Richardson
***Secretary:** H. M. Louderback
***Treasurer:** Robert T. Lagemann
Executive Secretary: Robert H. Carleton, NSTA, National Education Association Educational Center, Washington 6, D. C.

Directors

REGION I

***Director (1957-59):** Dorothy W. Gifford, Head, Science Department, Lincoln School, Providence, Rhode Island.
***Alternate (1957-59):** Clifford R. Nelson, Junior High School Science Consultant, Weeks Junior High School, Newton Centre, Massachusetts.

REGION II

Director (1957-58): Herbert Reichard, Physics Teacher, Department Head, Allentown Senior High School, Allentown, Pennsylvania.
Alternate (1957-58): Dorothy Alfke, Assistant Professor of Nature Education, Pennsylvania State University, University Park, Pennsylvania.

REGION III

***Director (1957-59):** Anita Bickford, General Science Teacher, Leland Junior High School, Chevy Chase, Maryland.
***Alternate (1957-59):** Donald C. Martin, Head, Department of Physics, Marshall College, Huntington, West Virginia.

REGION IV

Director (1957-58): Ernest E. Snyder, Assistant Professor of Education, State Teachers College, Florence, Alabama.
Alternate (1957-58): John A. Manning, Teacher of Physical Sciences, College High School, and Director of Student Teaching, Northwestern State College, Natchitoches, Louisiana.

REGION V

***Director (1957-59):** Richard W. Schulz, Head, Department of Science and Mathematics, Emmerich Manual Training High School, Indianapolis, Indiana.

(Please turn to page 151.)

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NSTA Activities

Convention Post-Mortems

It's already "looking ahead" to NSTA's Sixth National Convention (in Denver, Colorado) next year, as this issue of *The Science Teacher* goes to press. But with the Cleveland convention just ended, its contributions to science teaching, its accomplishments, its excitements, and its *comraderie* are still vivid in the minds of all who attended the many fact-packed sessions.

There's just room for a brief report on the Cleveland convention in this issue (the bulk of the copy for the magazine had gone to the printer before the convention opened). The meeting was an over-all success; as one convention-goer put it, "Regardless of our specific fields of interest, there are several things here for every one of us every day."

There were many science teachers at the sessions, of course, and there were also supervisors, other educators, and business-industry representatives. Each apparently found something of meaning at various sessions. The registration figure, as announced at the final Saturday luncheon, was 1311.

NSTA's membership booth was a busy spot; more than 40 new members signed up. Of these, 22 are Ohioans. One new member is a STAR Award winner who'd traveled across half the country to appear at one of the demonstration sessions. He announced Saturday morning, "I want to join this association; just in the couple of days I've been here, I've already 'stolen' 27 good new ideas."

The major addresses were interestingly varied in content, style, thought, and presentation. *TST's* editors are planning to publish several of these in future issues of the journal.

Annual Board Meeting

The dates are set for the annual business meeting of the Board of Directors. They are June 28 to 30. The place is the NEA Educational Center, the association's headquarters in Washington, D. C.

There are, of course, many questions and problems already on the agenda for the Board meeting. However, the directors also want suggestions from NSTA members. Have you a resolution you'd like to propose, business items you believe should be discussed, or ideas on new or revised actions and programs for the association? Expressions of opinion are wanted, too, and the directors urge you to be frank—you won't be quoted on what you say or "censured" for your comments.

Put your ideas and suggestions on paper as soon as you can and send them to NSTA's president, Dr. John S. Richardson, 193 Winthrop Road, Columbus, Ohio.

Supervisors List

NSTA's mailing list for supervisors provides a variety of interesting materials. If you're a supervisor and want your name added to this list, please notify NSTA what subjects and/or grade levels you supervise. That's to make sure you receive materials and services you'll really want. Write to Miss E. Louise Lyons, Membership Secretary, National Science Teachers Association, 1201 Sixteenth Street, N.W., Washington 6, D. C.

Northwest Meeting Postponed

The June 24-25 Northwest regional meeting, which was scheduled at the State College of Washington, Pullman, has been postponed until early fall. The planning committee decided on a fall date after finding that summer programs and other activities would keep many teachers away from a June meeting.

CEBS

NSTA's new Commission on Education in the Basic Sciences (CEBS) was given its first public announcement at the Cleveland convention. CEBS meets for the first time on May 3 and 4 at NSTA headquarters in Washington. This commission was established by the Board of Directors to survey the present scene in science education and develop programs and projects to help solve curriculum, teacher education, and other problems on a priority basis.

Dr. John S. Richardson, Professor of Education, The Ohio State University, Columbus, is chairman of the 14-member group. The other members are: Dean Stephen M. Corey, Teachers College, Columbia University, New York City; Dr. Farrington Daniels, Chairman, Chemistry Department, University of Wisconsin, Madison; Dr. Donald G. Decker, Director of Instruction, Colorado State College of Education, Greeley; Dr. C. C. Furnas, Chancellor, University of Buffalo, New York; Dr. William F. Goins, Jr., Assist-

ant Professor of Education, Brooklyn College, New York; Miss Helen E. Hale, Supervisor of Science, Baltimore County Public Schools, Towson, Maryland; Mr. Paul Klinge, Thomas Carr Howe High School, Indianapolis, Indiana; Dr. Robert Lagemann, Chairman, Department of Physics, Vanderbilt University, Nashville, Tennessee; Dr. Morris Meister, Principal, Bronx High School of Science, New York City; Dr. William G. Pollard, Director, Oak Ridge Institute of Nuclear Studies, Oak Ridge, Tennessee; Dr. S. R. Powers, Professor Emeritus, Teachers College, Columbia University; Dr. Ralph W. Tyler, Director, Center for Advanced Study in the Behavioral Sciences, Stanford, California; and Dr. Benjamin C. Willis, Superintendent of Schools, Board of Education, Chicago, Illinois.

ESSB

Action started at the Cleveland convention on a proposed change in the format and subscription plan for the *Elementary School Science Bulletin.* Meeting during the convention, the Elementary School Science Committee requested consideration of a change in the design of the publication and eight issues, instead of the present six, during the school year. The committee, whose chairman is Mrs. Marjorie H. Campbell, District of Columbia Teachers College, also proposed single subscriptions to *ESSB* at a nominal fee in place of the present $5-a-year school subscription. Single copies of *The Science Teacher* would be provided for the school library at additional cost.

Elementary school teachers and other NSTA members interested in elementary education are asked to write their views on the proposed plan to Dr. John S. Richardson or other members of the Board of Directors prior to the Board's June meeting.

EDITOR'S COLUMN—Continued from page 109

philosophy . . . needs to be answered in terms of an education as appropriate to a free society as the Soviet program is suited to the values and purposes of a totalitarian state. *Unfortunately, our American education falls wide of the mark at this critical juncture in history* (italics mine)."

The case for current efforts to step up the production of science teachers, scientists, engineers, and technicians in the United States is restated. Of its dire validity there can be no doubt. But *The Challenge of Soviet Education* establishes with equal force the great need for bright, capable youth to "consider careers" in the fields of politics, foreign relations, and the like. The war of ideas is certainly in full sway.

This book is so much "for us" that I believe the teachers of America alone should promptly elevate it to the best-seller list of *non-fiction* works—for non-fiction it is; it is reality, stark and brutal.

Robert H. Carleton

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FSA Activities

Roster of Sponsors

Twenty-eight names are already on the 1957 roster of sponsors of the Future Scientists of America Foundation. This is the list of business-industry organizations who, interested in helping develop future scientists, have already made grants to FSAF to support its activities. As of March 15, the 1957 list includes:

Allied Chemical & Dye Corporation
The Atlantic Refining Company
California Packing Corporation
Caterpillar Foundation
Cities Service Foundation
Corn Industries Research Foundation, Inc.
Crown Zellerbach Foundation
E. I. du Pont de Nemours & Company
The Fluor Foundation
Ford Motor Company
General Aniline & Film Corporation
International Harvester Company
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Ohio Brass Foundation
Parke, Davis & Company
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Rohm and Haas Company
Signal Oil & Gas Company
Socony Mobil Oil Company, Inc.
Spencer Chemical Company
Sprague Electric Company
Standard Oil of California
Standard Oil Company (New Jersey)
Sun Oil Company
United Aircraft Corporation
United States Steel Corporation

The Turning Wheel

The FSAF wheel keeps going round and round, and this is the 1957 turn into which it's now going. Administratively, the important session coming up is the meeting of the FSAF Administrative Committee. It's the annual spring meeting, taking place this year on May 11 and 12 in Washington, D. C. Past programs will be reviewed and assessed so that decisions can be made on their continuation or revision, if necessary. Proposals for new actions will be considered and decided upon. Important conclusions will be reached on where and how FSAF grants should be distributed to most effectively encourage future scientists in America.

Several FSAF committees met during the NSTA fifth annual convention in Cleveland late last month. Reports of their actions and decisions will be submitted for approval to the Administrative Committee.

FSAF also wants new proposals and ideas, comments and criticisms from NSTA members in general. Now is the time to make your suggestions, so that the Administrative Committee can consider them at the spring meeting. Feel free to express yourself frankly; your comments will be held in confidence. Write to the Administrative Committee chairman, Dr. Philip G. Johnson, Stone Hall, Cornell University, Ithaca, New York.

SAA Tally

Reports are beginning to come in from NSTA's eight geographic regions on the entries submitted in the sixth annual program of Science Achievement Awards for Students conducted by FSAF and sponsored by the American Society for Metals. The winners are scheduled to be announced in the May issue of *The Science Teacher*. These will include both the 120 regional awards winners and the 20 students receiving the Special National Awards for projects dealing with metals and metallurgy.

Closing date for entries was March 15. The tally kept at FSAF headquarters of teachers' requests for entry materials showed 2122 separate requests by deadline time. As a result of these, more than 27,000 sets of student entry forms were distributed.

Unfortunately, some 100 additional requests for the entry forms could not be filled. More than half of this number were requests which arrived with either the name of the state or the names of both the city and the state missing in the address. Obviously, these simply had to be discarded with the hope that the individual teachers, not receiving a reply, would repeat their requests for the student materials.

The balance of the 100 were requests which came in so close to the March 15 deadline that time would not permit both delivery of the entry forms to the teacher and subsequent submission of the student projects by March 15. The moral to this sad tale is plain: Better to be an early bird than miss out entirely. Start planning now on entries for the 1958 program.

WOLFBEIN—continued from page 119

expected to generate advanced demands for additional consumer goods, housing, highways, and capital investment.

Second, we project about a 50 per cent increase in the gross national product by the middle '60's, assuming productivity increases of the kind we have had up to now. This would amount to an increase of about 25 per cent in the gross national product per capita—the total amount of goods and services available for every man, woman, and child.

Third, we note that these developments call for an expansion of about ten million jobs between 1955 and 1965.

What kinds of changes in our occupational structure will these ten million additional jobs bring?

Here are a few of the highlights which are particularly relevant to the problem.

1. One of the most impressive areas of growth is represented by the professional worker. If previous trends continue, our projections show that professional personnel may hit close to the eight-million mark by 1965, accounting for a little more than one out of every ten workers—more than double the 1910 figure. There is real need for expansion in many of the important groups here. The one million workers in engineering and science, the 1½ million in teaching, and the one million in medical services (doctors, dentists, nurses, etc.) will undoubtedly all increase sharply and account for a major part of the expansion in professional employment over the next decade.

2. The two other groups comprising the white collar occupations are also expected to increase—particularly the clerical and sales people, who already account for one out of every five people in the labor force today. Taken together, the white collar occupations actually have reached an historic position according to our latest information. Last year (1956), they represented the single biggest group in the labor force and they are expected to be well out ahead by 1965 and 1975. A few years ago, we reached this kind of situation in our industrial distribution: there were (and are) more people employed in industries producing services than those producing goods. Now the occupational distribution has reached the same stage: today we have more white collar than blue collar workers in the American labor force.

3. Another important group which we expect will expand both numerically and percentagewise are the industrial workers at the craftsman (skilled) and operative (semi-skilled) levels. We

THE LABOR FORCE OF THE UNITED STATES
Classified by Age and Sex

Actual 1956 Estimated 1965
(In millions)

	1955	*1965*	*Change 1955–1965*
Total labor force	*68.9*	*79.3*	*+10.4*
Males	*48.1*	*52.9*	*4.8*
14–19 years	3.4	5.0	1.6
20–24 years	4.9	6.0	1.1
25–34 years	11.5	10.7	− .8
35–44 years	10.8	11.4	.6
45–54 years	8.9	10.2	1.3
55–64 years	6.1	7.0	.9
65 years and over	2.5	2.6	.1
Females	*20.8*	*26.4*	*5.6*
14–19 years	2.0	3.0	1.0
20–24 years	2.4	3.1	.7
25–34 years	4.3	4.2	− .1
35–44 years	4.8	5.7	.9
45–54 years	4.1	5.8	1.7
55–64 years	2.4	3.5	1.1
65 years and over	.8	1.1	.3

expect increases particularly among the building trades, the metal trades, and the skilled mechanics, repairmen, and technicians.

4. On the other hand, reductions seem to be in order for both the farm segment of the economy and the less skilled laborers. If past trends and current technological developments, such as automation, are indicative, we may expect an actual decline in employment in these occupations in the face of a ten million rise in the total number of jobs.

All of this certainly adds up to a continuing and persistent increase in the skill level of the American labor force; in the number and proportion of workers requiring extensive education, training, and skill development; in the number of quality personnel we call creative manpower; and in the need for the especially able or gifted in our population.

Sources of Labor Supply

Can we meet these needs? Where will the additional workers come from?

In round numbers, our figures show that the approximately ten million increase in the labor force by 1965 will be distributed as follows:

About 4½ million will be young persons 14-24 years of age.

About five million will be 45 years of age and older.

(Please turn to page 147.)

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Entirely self-exciting, the GENATRON cracks into action at the snap of the switch—whose only function is that of starting the motor drive. No auxiliary charging method is employed. Hence, despite an output measured in hundreds of thousands of volts, no hazard is involved, for the operator or for the observers.

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THE CAMBOSCO GENATRON is designed to deliver, in normal operation, a discharge of the order of 250,000 volts. That figure, a conservative rating, is based on many trials conducted under average conditions. With ideal conditions, a potential difference of 400,000 volts has been achieved.

Modern Design— Sturdy construction and ever-dependable performance distinguish the GENATRON from all electrostatic devices hitherto available for demonstration work in Physics. This powerful, high-potential source, reflecting the benefits of extensive experience in electrostatic engineering, has absolutely nothing but purpose in common with the old fashioned static machine!

NO FRAGILE PARTS—Durability was a prime consideration in the design of the GENATRON which, with the exception of insulating members, is constructed entirely of metal.

The only part subject to deterioration is the charge-carrying belt, which is readily replaceable.

NO TRANSFER BODIES—In all conventional influence machines, whether of Holtz or Wimshurst type, electrical charges are collected and conveyed (from rotating plates to electrodes) by a system of "transfer bodies." Such bodies have always taken the form of metal brushes, rods, button disks or segments—each of which, inevitably, permits leakage of the very charge it is intended to carry, and thereby sharply limits the maximum output voltage.

It is a distinguishing difference of the GENATRON that electrical charges, conveyed by a non-metallic material, are established *directly upon the discharge terminal.* The attainable voltage accordingly depends only upon the geometry of that terminal and the dielectric strength of the medium by which it is surrounded.

Unique Features of the CamboscO Genatron

DISCHARGE TERMINAL Charges accumulate on, and discharge takes place from, the outer surface of a polished metal "sphere"—or, more accurately, an oblate spheroid.

The upper hemisphere is flattened at the pole to afford a horizontal support for such static accessories as must be insulated from ground. A built-in jack, at the center of that horizontal area, accepts a standard banana plug. Connections may thus be made to accessories located at a distance from the GENATRON.

CHARGE-CARRYING BELT To the terminal, charges are conveyed by an endless band of pure, live latex—a CamboscO development which has none of the shortcomings inherent in a belt with an overlap joint.

DISCHARGE BALL High voltage demonstrations often require a "spark gap" whose width can be varied without immobilizing either of the operator's hands.

That problem is ingeniously solved in the GENATRON, by mounting the discharge ball on a flexible shaft, which maintains any shape into which it is bent. Thus the discharge ball may be positioned at any desired distance (over a sixteen-inch range) from the discharge terminal.

BASE...AND DRIVING MECHANISM Stability is assured by the massive, cast metal base—where deep sockets are provided for the flexible shaft which carries the discharge ball, and for the lucite cylinder which supports, and insulates, the discharge terminal.

The flat, top surface of the base, (electrically speaking), represents the ground plane. Actual connection to ground is made through a conveniently located Jack-in-Head Binding Post. The base of the Genatron encloses, and electrically shields, the entire driving mechanism.

PRINCIPAL DIMENSIONS The overall height of the GENATRON is 31 in. Diameters of Discharge Ball and Terminal are, respectively, 3 in. and 10 in. The base measures 5¼ x 7 x 14 in.

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Operates on 110-volt A.C. or 110-volt D.C. Includes: Discharge Terminal, Lucite Insulating Cylinder, Latex Charge-Carrying Belt, Discharge Ball with Flexible Shaft, Accessory and Ground Jacks, Cast Metal Base with built-in Motor Drive, Connecting Cord, Plug, Switch, and Operating Instructions.

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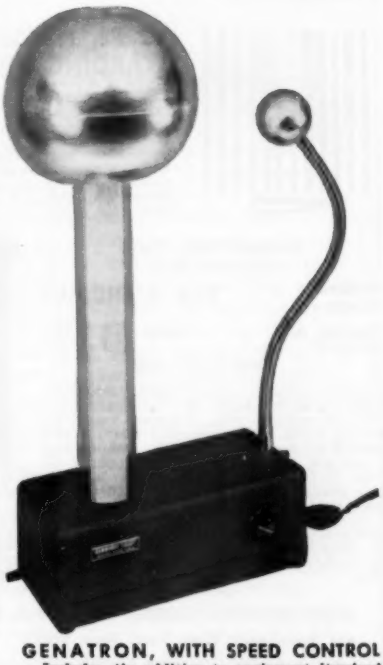

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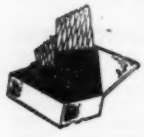

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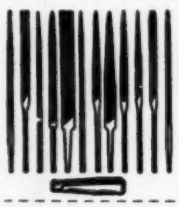

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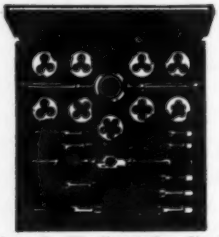

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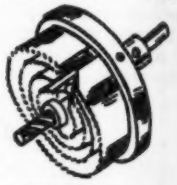

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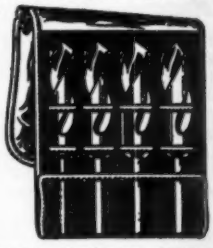

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Only about ½ million will be between 25 and 44 years of age.

And, more than half of this total increase will be represented by women.

The composition of this labor supply makes a number of very important points some of which we can only touch upon here. For example, the so-called "older worker" is going to be a major supplier of labor in the decade ahead; more than half of our total labor supply increase is also going to come from women. In the kind of labor market we project, age or sex barriers to employment would simply cut us off from worker resources—a poor policy at any time, and doubly so in a decade when workers will be in such short supply.

The kind of short supply we anticipate is dramatically illustrated by what is going to happen to the group 25-34 years of age—one of the prime working ages in terms of career development and contributions to the skills of the American work force. In the face of a 25-million increase in population, this age group will experience a decline of about 2¼ million between 1955 and 1965. A little reflection will tell us why: this is exactly the age cohort born between 1930 and 1940—a period of very low birth rates in our history. As a result, the number of workers in this age group will also go down—by about 900,000 persons.

All of this points to the critical importance of younger persons in meeting our future manpower needs. As we indicated, the group 14-24 years in the labor force is expected to go up by about 4½ million by 1965. These are the persons who now are the boys and girls who make up the elementary school population of this country. In the very immediate years ahead, they will comprise the secondary school enrollment in this country. What we organize to do *now* in the schools will thus, in a major sense, irrevocably affect a major portion of the pivotal manpower resources of the next decade.

These, then, are the dimensions of our future labor demand and supply. To have them gear in effectively is going to require the cooperative efforts of all of us at the federal, state, and local levels—in business, industry, and labor. But no matter how we look at this complex, very much is going to depend on the uniquely critical contribution that the schools are going to be called on to make. The schools will have to provide the amount and kind of education needed to supply the nation with a work force whose talents and gifts have been developed to their maximum possible point. In a very real way, this is what we are going to need to insure continued technical progress.

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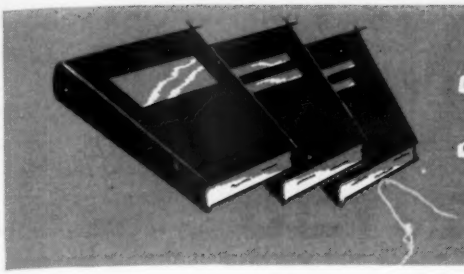

BOOKS RECEIVED

GREAT ESSAYS IN SCIENCE. Edited by Martin Gardner. 408p. 35¢. Pocket Books, Inc., New York. 1957.

An original pocket book edition of 30 essays on science themes by 28 outstanding men and women. The first essay is Darwin on evolution and the last is Einstein on relativity. Between the two are a diverse collection, covering such different and interesting subjects as the beautiful woman, science and literature, the bee, the sea, logic, and the moon.

SPACE, TIME, AND CREATION. Milton K. Muntz. 182p. $3.75. The Free Press, Glencoe, Illinois. 1957.

A new look at what man knows about the astronomical universe. Subtitled "Philosophical Aspects of Scientific Cosmology," the book deals with such topics as the "age of the universe," theories of "continuous creation," and the meaning and importance of theory-construction in scientific cosmology. The views of Kant, Einstein, Milne, and others are considered.

URANIUM PROSPECTING. Hubert Lloyd Barnes. 117p. $1. Dover Publications, Inc., New York. 1957.

A paperbound guide for the layman interested in uranium prospecting. It gives the how's and why's and discusses uranium ores, geological occurrences of uranium, and field conditions.

HOME AQUARIUM HANDBOOK. Griffith and Lillian Borgeson. 144p. $2. Arco Publishing Company, Inc., New York. 1957.

A practical summary for the fish hobbyist. The book reports on equipment and ways to keep fish healthy, getting started in the hobby, foods and feeding, and a variety of other related subjects. There is also a section cataloging standard fish and a directory of aquarium societies.

THEORIES OF THE UNIVERSE. Edited by Milton K. Muntz. 437p. $6.50. The Free Press, Glencoe, Illinois. 1957.

A comprehensive selection of original writings "from Babylonian myth to modern science." Some 30 pieces present the elements of both continuity and controversy in serious investigations into the nature of the universe. In introductions to separate sections of the book, the editor provides a history of the particular subject treated.

HOW TO KNOW THE MINERALS AND ROCKS. Richard M. Pearl. 192p. 50¢. A Signet Key Book, The New American Library, New York. 1957.

An illustrated guide to more than 125 important gems, ores, and metals of the mineral kingdom. This reprint edition provides the beginner or amateur collector with pertinent data. The book includes information on the use, origin, chemical content, and geographic location of each of the specimens described.

THE LIFE AND DEATH OF CELLS. Joseph G. Hoffman. 301p. $4.50. Hanover House, Garden City, New York. 1957.

A detailed summary of what science has discovered about cells—how they grow, divide, organize in tissues and in humans, and become cancerous and die. Written for the layman, the book poses the question, "What is life?" and presents an answer in terms of "life's simplest unit, the individual cell."

THE WIND AND THE WEATHER. Joe Bolton. 277p. $3.95. Thomas Y. Crowell Co., New York. 1957.

A reply to the proverbial query, "What is this thing called weather?" The author, a TV weather reporter, writes in informal style on the history of weather, the science of meteorology, how rain is made, how to read nature's warning signals, what to do in a storm, and many other topics related to meteorology, including a section on atomic weather. With odd bits and pieces of weather lore scattered through the text, this is a book which combines information with entertainment.

THE POCKET GUIDE TO THE UNDERSEA WORLD. Ley Kenyon. 256p. $5.95. A. S. Barnes and Company, New York. 1957.

A comprehensive report on underwater diving, with practical information for those who want to explore the oceans. Its chapters deal with equipment, the first and subsequent dives, medical considerations, underwater photography, kinds of fish, and related subjects. The book contains many color paintings of fish as well as black-and-white illustrations.

SCIENCE IN THE MAKING. Joel H. Hildebrand. 116p. $3. Columbia University Press, New York. 1957.

An approach to science from Leonardo da Vinci's viewpoint that "there is no higher or lower knowledge, but only one, flowing out of experimentation." The author explains the ways by which scientists attack problems and thereby contradicts the popular notion that science involves special kinds of reasoning.

FISHES. Herbert S. Zim and Hurst H. Shoemaker. 160p. $1 paper, $1.95 cloth. Simon and Schuster, New York. 1956.

A pocket book "Golden Nature Guide" to familiar American fresh- and salt-water species. Color illustrations add to the value of this book in identifying many species of fish.

SISTER MARY STEPHEN—continued from page 128

Wilma has a fine collection of Indian arrowheads and implements, all of which were collected on the farm where she lives. She is quite interested in her collection and feels that it will be a lifelong hobby with her.

Four of our junior boys are working with radio sets. They have all built crystal sets and worked on two-tube sets. The aim of the project is to become familiar with the principles of radio.

The cost is not such an important factor in their work, for the students provide their own materials and then keep their projects. They show a lot of ingenuity in providing material for themselves. Junk yards, secondhand stores, garages, and dime stores provide plentiful material. At home they unearth old clocks, erector sets, toys, and mechanical and electrical devices which they can use.

Some of the youngsters like to bring their project to school and work on it during the noon hour. They are given some cupboard space in the laboratory and are allowed to work there. Since there are not too many of them who do this, they can be supervised easily. Still, most of them prefer to work at home or else come to school on Saturday afternoon.

The students come for help and guidance at any time, but especially during the noon hour. There can be no set rule for guiding these students as some need more help than others.

The boys and girls use their own initiative, too, in writing and asking for information from industrial corporations, research institutions, hospitals, and colleges. There are people here in town who can and do give them valuable information and are pleased that the younger generation asks their advice.

At this level, project work is more specific. The students keep notebooks and in these they explain what they are going to do and why, the materials needed for their projects, and any information available on the subject. The students who do the best projects are the ones who develop their own ideas after having studied a problem thoroughly.

It is not good to discourage their ideas even though they may be impractical. For example, one of the younger boys decided that he wanted to study cancer. After three or four months of gathering literature, visiting cancer hospitals, working with growths on tomato plants, he decided that he was ready to work now only on a simpler project. The experience of his "cancer project," however, may have helped his present decision to follow a career of medical research later in life.

If a project is well developed and a student is able to explain his ideas to others at a meeting, a science fair, or a science night held at school, he benefits greatly from the confidence that it gives him. It would seem, however, that the most valuable lesson learned by the older student in working on science projects is that of realizing the value of his regular classwork and studies. He seems to understand better why he should study for himself, why it is his duty and obligation to study, and what the value of study will mean to him later in life.

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Audio-Visual REVIEWS

LIFE CYCLE OF A MUSCOVY DUCK. 11 min. sound, 1949. Color. Bailey Films, Inc., 6509 De Longpre Ave., Hollywood 28, Calif.

Recommendation: Upper level junior high school grades in science areas. The emphasis on the heredity of the muscovy duck makes the film helpful in biology studies.

Content: Relating the domesticated muscovy duck to its wild Brazilian ancestry, the film shows the life habits and general structure of this species. It also depicts minor specifics of birds, such as preening feathers with oil secreted by the bird itself. Animated heredity charts are used effectively in the film.

Evaluation: Excellent color photography and good presentation, progressing from simple to more complex treatment of the subject matter.

◊ ◊ ◊

CRUSTACEANS. 17 min. sound, 1955. Color. Encyclopaedia Britannica Films, 1150 Wilmette Ave., Wilmette, Ill.

Recommendation: Senior high school classes in advanced biology and college freshman classes in zoology.

Content: The film presents a study of arthropods with emphasis on crustaceans. A wide variety of land and sea crustaceans are shown in their natural habitats and each group is identified both in the commentary and by subtitles. A number of life functions are emphasized as the different animals are shown. Special attention is paid to the common freshwater crayfish.

Evaluation: Excellent content and presentation with effective use of close-ups for details and actions. The use of color is an advantage in a film of this type. The technical vocabulary limits use of the film to high school and college levels.

◊ ◊ ◊

ANIMALS—WAYS THEY MOVE. 11 min. sound. $50 B & W, $100 Color. Encyclopaedia Britannica Films, 1150 Wilmette Ave., Wilmette, Ill.

Recommendation: Primary and intermediate grades in animal and nature study areas.

Content: In close-up action shots, the film shows the way animals move in the water, on land, and in the air. It explains how an animal's movements help it to find food, find a home, and escape from its enemies.

Evaluation: Good sound and photography. The film can be used more effectively for stimulating interest and further study than for detailed teaching. Slow motion photography is used to good advantage but the film tends to cover too much. A teacher's guide is included with the film.

◊ ◊ ◊

ANIMALS—WAYS THEY EAT. 11 mi. sound, 1956. $50 B & W, $100 Color. Encyclopaedia Britannica Films, 1150 Wilmette Ave., Wilmette, Ill.

Recommendation: Primary and intermediate grades in science and nature study areas. The film can also be a valuable teaching aid in biology class studies of the eating habits of animals.

Content: Giving extensive coverage to all types of animals, the film presents their eating habits and related activities. Why they need to get food, the adaptations the animals make in obtaining it, and the ways in which the food is actually eaten are given attention. Tortoises, sparrows, crayfish, butterflies, and lions are all dealt with effectively in a general manner.

Evaluation: Excellent photography and organization of subject matter. Possibly too many different animals are dealt with; more detailed information could have been given if fewer animals had been presented.

DIRECTORS—continued from page 139

***Alternate (1957-59):** C. Leroy Heinlein, General Science Teacher, Audio-Visual Coordinator, Woodward High School, Cincinnati, Ohio.

REGION VI

Director (1957-58): Henry E. Goebel, General Science Teacher, Irving Junior High School, Lincoln, Nebraska.

Alternate (1957-58): Gertrude M. Olson, Biology Teacher, Great Falls High School, Great Falls, Montana.

REGION VII

***Director (1957-59):** Paul A. Wilkinson, Chairman, Science Department, Manual High School, Denver, Colorado.

***Alternate (1957-59):** Horace H. Bliss, Associate Professor, Chemistry Chairman, Oklahoma Science Service, Extension Division, University of Oklahoma, Norman, Oklahoma.

REGION VIII

Director (1957-58): Edward M. Gurr, Chemistry Teacher, South Mountain High School, Phoenix, Arizona.

Alternate (1957-58): Robert A. Rice, Chemistry Teacher and Head, Science Department, Berkeley High School, Berkeley, California.

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the following retiring members of the 1956-57 Board who gave unstintingly of their time and efforts to the Association: **Retiring President** Robert Stollberg, San Francisco, California; **Secretary** Gertrude W. Cavins, San Jose, California; **Treasurer** Richard H. Lape, Snyder, New York; **Region I Director** Fletcher Watson, Cambridge, Massachusetts; **Region III Alternate Director** Howard B. Owens, Prince Georges County, Maryland; **Region V Directors** Paul Klinge, Indianapolis, Indiana, and Violet R. Strahler, Dayton, Ohio; and **Region VII Alternate Director** Frederick B. Eiseman, Jr., St. Louis, Missouri.

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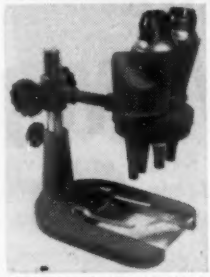

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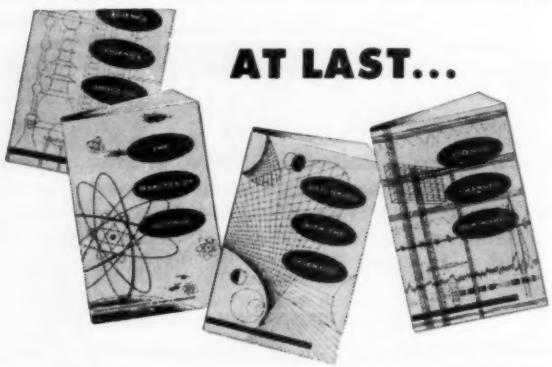

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